The
GEOGRAPHICAL JOURNAL

Vol XCIV No 4 R.G.S. *October 1939*

AGRICULTURAL COLONIZATION IN THE PONTINE MARSHES AND LIBYA

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Evening Meeting of the Society, 22 May 1939

MODERN Italian colonization differs fundamentally from anything that has hitherto been put into large-scale operation. Its purpose is social and political rather than purely economic: it aims at mass redistribution of population and strengthening of political power, and in consequence it is not to be judged by its financial returns. It is carried out on the strictest scientific lines by large corporations acting in close association with the Government. From the outset it is envisaged as a whole: it is based on a careful survey of the region, and a full study of its potentialities: it begins by building roads, small towns, and farm-houses, and by laying out farms. Then, and not till then, the colonists are brought in and they are at once set to carry out the prearranged cropping scheme, under expert guidance and with adequate provision of everything necessary for success. The produce is taken over by the organizing body for sale at a remunerative price and arrangements are made whereby after a period of twenty-five or thirty years the colonist owns the farm. The whole set of developmental operations from start to finish is called *bonifica integrale*.

The Pontine Marshes

The Pontine Marshes lie south of Rome between the Volscian, Ausonian, and Lepinian Hills and the sea. The area is about 80,000 hectares; the region is lowlying and soaked with water from the hills. Until recently about two-thirds was scrub forest and the rest rough pasturage, but any small value the timber and grazing possessed was more than offset by the great unhealthiness of the region for men and animals; malaria was rife and there were numerous animal diseases. Many attempts had been made at reclamation, but none had permanently succeeded.[1]

[1] For a historical summary, and account up to 1934, see 'Land reclamation in Italy,' Cesare Longobardi, translated by Olivia Rossetti Agresti (London, 1936). A later account up to 1938 is given by F. Angelini, 'Das Meliorationswerk der Pontinischen Sümpfe' (Rome, 1938), and by Christopher Turnor, 'Land reclamation and drainage

In 1926 the work of reclamation was begun by the *Genio Civile di Roma*; the draining was done by two *Consorzii*, and the laying out as farms by the great Corporation called after the ex-Service men, *Opera Nazionale per i Combattenti*, which in 1931 was granted 18,000 hectares on which to begin. The first step was to make a detailed survey; a map was drawn on a scale of 1 in 5000 with contours at half-metre intervals. The map explained the failure of the earlier reclamation schemes and indicated the correct procedure: simply to drain off the water was insufficient, it must be intercepted as far as possible and kept out of the marsh. The waters coming down from the hills were divided into upper, middle, and lower. The upper waters were intercepted and carried to the sea by the Mussolini Canal, 37 kilometres long, with a capacity of 400 cubic metres per second (Plate 1). The middle waters were collected in the Astura river, which was canalized, and which runs out near the point Torre Astura. The lower waters were collected in a series of conduits and pumped into a third canal which empties into the sea at Torre Olevola; the most important pumping station is Mazzocchio, one of the largest in Italy.

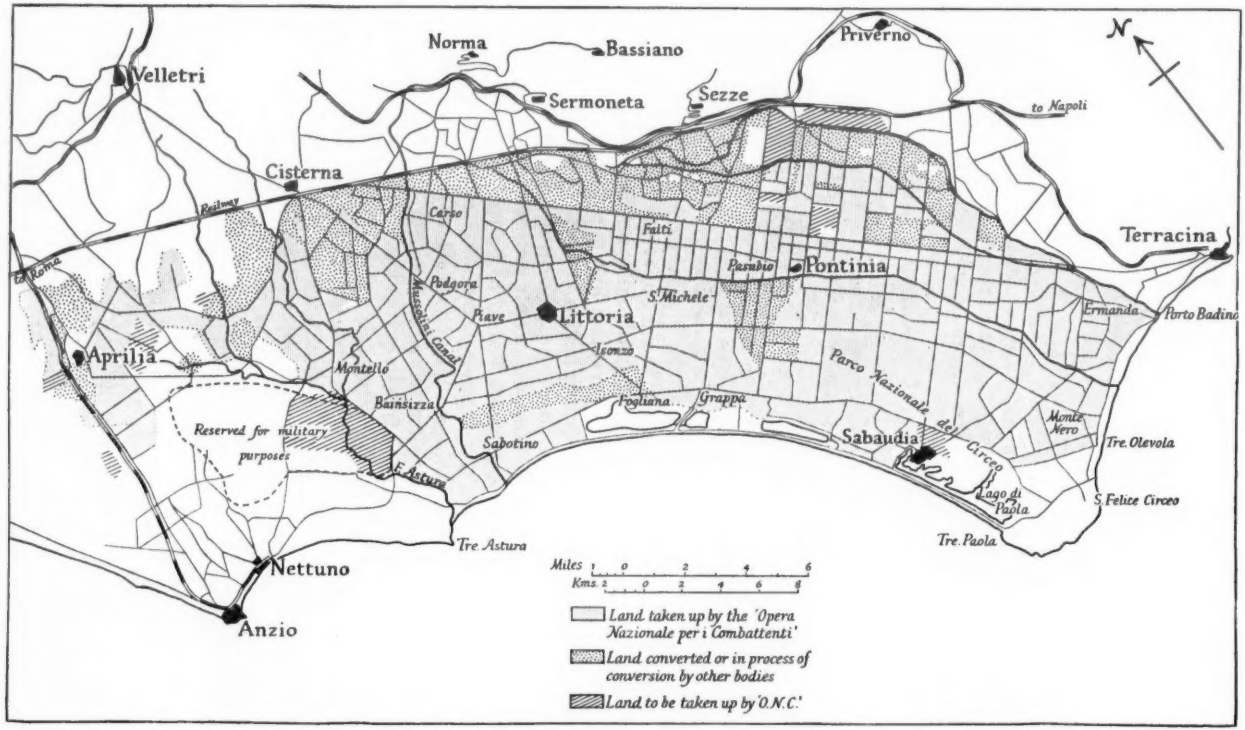
The making of the canals was difficult and often unpleasant; the men sometimes had to work up to their waists in water, and they suffered much from malaria. About 20,000 hectares of wood had to be cleared; the trees were cut down in the water and their stumps and roots removed; mainly oak (*Q. suber* L. and *robur* L.), they were used for railway sleepers and charcoal. The shrubs were *Olea europea* L., *Erica arborea* L., *Myrtus* sp., and others. An area of 3000 hectares was however left in wood as a National Park. Certain other areas were also reserved. Roads were made as speedily as possible, drinking water was laid on, and a large thermo-electric power station set up for working the pumps. Provision was also made for irrigation, for the summers are dry, and crops may then need watering.[1]

When the ground was dry enough, the *Opera* laid it out in farms and built the houses and villages. By the end of 1937, 48,350 hectares had been prepared for farming and 2574 farms set up, and there are still plans for more. Four towns have been founded: Littoria, the chief town of the province, in 1932; Sabaudia on the shores of Lago di Paola in 1933; Pontinia in 1935; and Aprilia in 1936; a fifth, Pomezia, is to be inaugurated at the end of 1939. The total population of the province in December 1937 was 25,850.

It is characteristic of the unbounded faith and optimism of the Italians that these towns are each designed as a complete unit by a competent architect. There is no "shack" stage such as is common elsewhere, no temporary corrugated iron shops or houses, but from the outset permanent buildings planned on generous and pleasing lines. Each town has its *piazza* dominated by the church; it has also the complete set of public buildings, the house of the Fascists, school, clinic, café-restaurant, etc. (Plate 2). Each town is distinctive, and the visitor is never in any doubt as to where he is. It is taken for granted

in Italy' (London, 1938). Valentino Orsolini Cencilli's "Le Paludi Pontine" (*Op. Naz. Comb.*, 1934) is particularly attractive. Detailed maps are given in 'La bonifica integrale nel Decennale della Legge Mussolini,' by Giuseppe Tassinani (Bologna).

[1] The annual rainfall is about 500–600 millimetres, mostly in winter.


Norma
Bassiano
Priverno
N
Velletri
Sermoneta
Sezze
to Napoli
Cisterna
Railway
Carso
Falti
Terracina
to Roma
Pontinia
Pasubio
Podgora
S. Michele
Littoria
Piave
Ermanda
Porto Badino
Aprilia
Isonzo
Montello
Parco Nazionale del Circeo
Bainsizza
Fogliana
Grappa
Monte Nero
Reserved for military purposes
Sabotino
Sabaudia
Tre Olevola
F. Astura
Lago di Paola
S. Felice Circeo
Tre Astura
Tre Paola
Nettuno
Anzio
Miles 1 0 2 4 6
Kms 2 0 2 4 6 8
Land taken up by the 'Opera Nazionale per i Combattenti'
Land converted or in process of conversion by other bodies
Land to be taken up by 'O.N.C.'

that the town must be as beautiful as it can be made: no question arises as to whether good architecture is necessary, whether the peasants can appreciate it or the State afford it; the purpose is that the peasants shall live and grow up in attractive surroundings which they will learn to appreciate. The farm-houses are uniform in type but with variations in design which save them from monotony (Plate 3). Provision is made for tree planting: pines near the sea and eucalypts inland.

Everything is then ready for the colonists, and they are brought in *en masse*. They are mostly peasants from the more crowded parts of Italy, and they are carefully selected on strict Fascist principles, always having in view the fundamental purposes of increasing the number of young Fascists and of binding the peasant to the soil. The colonists are placed on their farms, they are told what to do and shown how to do it. The agricultural part of the scheme affords an excellent example of collaboration of economic, scientific, and technical experts for the designing and carrying out of a suitable form of agriculture for the region. The cropping scheme was decided, experimental farms and a number of demonstration fields were set up under the charge of the well-known expert, Professor G. Tommasi, and manurial and cultivation schemes fully worked out [1] (Plate 4). The soils vary and include rich volcanic soils in the higher parts, some difficult clays, and towards the sea some very poor sands. The chief manurial needs of the region are lime to correct the acidity of the soil, phosphate after the first year or so, and farmyard manure. Wheat is the most important crop at present, occupying about half the land, though the proportion is likely to fall, and the region figures in the "Battle for wheat," the purpose of which is to enable Italy to produce all the wheat she requires so as to be independent of foreign supplies. It was necessary to find suitable varieties. Two methods were adopted: hybridization by Professor Strampelli, whose variety *Mentana*, an early sort, has been found extremely useful; and selection by Professor Todaro, of Bologna. There are still difficulties to be overcome. For example, it is difficult to find the best time for sowing. If the wheat is sown in autumn it is liable to suffer from winter rainfall, while if sown in spring it suffers either from April frost or from May and June droughts according as it is sown early or late. Further, the wheat requires not only phosphate but also nitrogenous manure; if this is given early the plants develop quickly and so incur risk of suffering from late frosts; if it is given late the plants tend to produce too much straw and too little grain. Difficulties of this kind are never insuperable, and can safely be left to the highly competent agricultural experts of the Italian Department. It is too soon to speak of an average yield, but in 1938, a good year, the crop was 14 dz. per hectare. At the Experiment Stations however higher yields are obtained.

Fodder crops come next in importance, and occupy over 40 per cent. of the land; they are receiving considerable attention, as it is desired to develop animal husbandry. The production of sugar beet is increasing rapidly. Several rotations are being tested: a promising one is:

[1] See G. Tommasi, "La fertilisation des terres bonifiées des marais pontins," *R. Staz. Sper. Chim. Agrar.*, Rome, 1938.

1. Bridge over the Mussolini Canal, Pontine Marshes

2. Littoria, Pontine Marshes

3. Pontine Marshes: a typical farm

4. Pontine Marshes: experimental farm showing in distance effect of using phosphate

1st year ..	.. October	Wheat sown.
2nd year	.. June	Wheat harvested.
	October	Beans, oats, clover, mixed, sown for forage.
	December	1st cut for fodder.
3rd year ..	.. March	2nd cut for fodder.
	early April	Maize sown, sugar beet and potatoes planted.
	October	Wheat sown: rotation starts again.

On this rotation one-third of the land is in wheat, one-third in fodder crops, and one-third in other crops. Vines and fruit are grown only for local consumption; hemp and cotton are being tried.

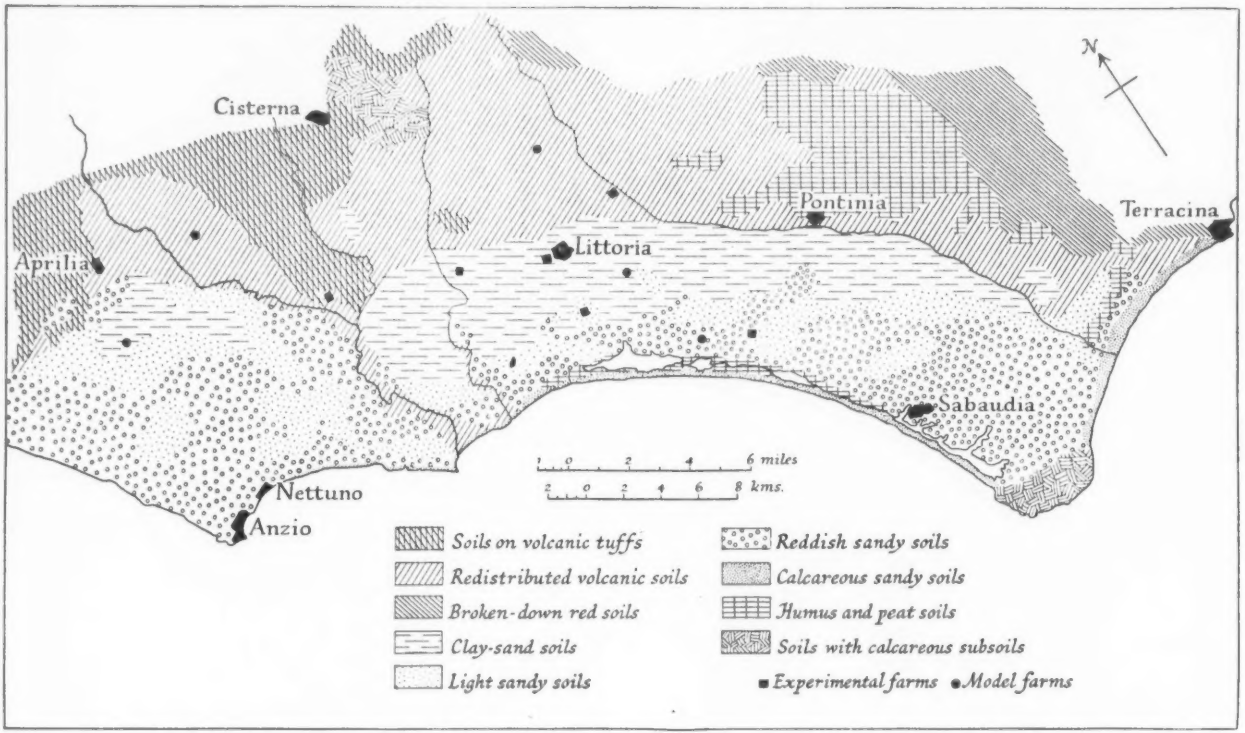
The holdings are about 10–12 hectares on fertile soil and 15–25 hectares on the poor sandy soil near the sea. The houses are well built and roomy. One that I visited had two rooms and a kitchen downstairs and four large rooms upstairs. Fourteen people lived there: the father and mother with five children, and another son and his wife with four children; all sturdy, healthy-looking people. In the kitchen was an open hearth, and the cooking was done in a pot slung over the fire: outside was the oven for bread baking. A wire gauze porch protected the door of the house and kept out mosquitoes. There was also a barn and cattle shed. The farming is entirely of the smallholder type, with bullocks as the source of power, in sharp contradistinction from the initial reclamation, which was done with large motor-driven machinery.

The cost of building the house and barn was on the average about 40,000–50,000 lire, which at the time represented some £700–875; another 1000 lire per hectare were spent in putting the land in order, in addition, of course, to the expenditure on local roads, local drainage, etc. Published estimates for this part of the work are [1]:

	Total area, ha.	*Area already benefited*	*Estimated cost of works, million lire*
Littoria ..	107,000	64,000	600
Pontinia ..	27,000	27,000	350

This would make the total cost of the agricultural works by the *Opera Nazionale* over 1000 million lire. No account however is taken here of the expenditure by the Government on main canals, main roads, cities, and other public works. Until the scheme is completed it will not be possible to do more than guess at the figures, but already there seems some justification for an estimated total expenditure of 2000 million lire, to give ultimately 60,000 hectares of agricultural land, a cost of something over 30,000 lire per hectare. There is no attempt to justify the work on purely economic grounds: the purpose is much wider. In one of those pregnant sentences that travel all over Italy, Mussolini has laid it down that land reclamation has a social value: "To reclaim the land, and with the land the men, and with the men the race." By his followers emphasis is laid on "the victory of wheat growing . . . the acceleration of progress when, animated by profound and tenacious faith, the

[1] 'L'Agro Pontino' (Aprilia, 1938).


N
Cisterna
Aprilia
Littoria
Pontinia
Terracina
Sabaudia
Nettuno
Anzio
1 0 2 4 6 miles
2 0 2 4 6 8 kms.
Soils on volcanic tuffs
Redistributed volcanic soils
Broken-down red soils
Clay-sand soils
Light sandy soils
Reddish sandy soils
Calcareous sandy soils
Humus and peat soils
Soils with calcareous subsoils
Experimental farms
Model farms

Italians march under the precise and infallible guidance of the Duce. This is a magnificent victory which has brought to Italy great and indestructible benefits not only economically but also from the spiritual and political point of view." [1]

At the same time it is intended that the utmost should be obtained from the land. The family work the farm, but Fascism permits of various methods of payment, and the one used here is a modification of the metayage or share farming, well known in Italy, in which the *Opera* provides animals, equipment, implements, the first seeds and first cultivations, and takes half the produce, while the family provides the labour for running the farm, and making and maintaining the farm drainage—this is done by trenches, not pipes; it retains also the other half of the produce for use or sale through the *Opera*. Certain things however are not shared, but retained entirely by the family: the pigs, the poultry, milk for their own consumption, the produce of the vegetable garden, and certain allotments of wood. It is further guaranteed that the income per labour unit shall not fall below 1500 lire per annum. In addition, some day-work is available on the roads and canals. The cultivator will ultimately acquire the holding, when the *Opera* considers the colonists sufficiently firmly established to be able to buy on a fifteen-year purchase scheme. In the meantime the *Opera* directs all the farming operations.

PROGRESS IN THE PONTINE MARSHES (*Opera Nazionale per i Combattenti*)

	1932	1933	1934	1935	1936	1937
Area divided up for farms, etc., hectares	10,000	21,000	33,000	36,000	40,000	48,330
No. of farms	480	1,250	1,770	2,080	2,240	2,574
Population	5,200	13,700	19,300	23,200	24,700	30,000
Cattle	2,900	9,600	15,600	16,900	17,900	20,000
Wheat produced, dz.	7,714	31,700	71,400	110,300	91,800	118,000
Sugar beet, dz. ..	—	200	8,400	13,300	71,900	191,000

In 1937 there were also 5600 pigs, 160,000 head of poultry, 200 horses, and 20,000 cattle for milk and work. The cattle are mostly of the white, long-horned Maremmana race, very good for work; some Chianina (short-horned) blood is being introduced. For dairy produce the brown and white Swiss cattle are used, but the Simmenthal are being tried. The agricultural system is not suited to sheep: indeed the changes in agricultural methods in Italy have tended to reduce the sheep population, and the numbers have fallen from 12 millions in 1913 to 8·9 millions in 1936.

From the dunes near the sea one gets a good view over the whole province. It is a most impressive sight. The scrub and the marsh have gone: in their place is a vast cultivated plain dotted with comfortable farm-houses, traversed by good straight roads and canals; the little towns stand out, but not too obtrusively: the church spire and the public buildings glisten in the sun and the whole enterprise is a concrete expression of the modern Italian watchword "Avanti !"

The Pontine Marsh scheme forms only a small part of the total reclamation work in Italy. It is perhaps better known, even in Italy itself, than any of the

[1] Giuseppe Tommasi, 'La bonifica dell'Agro Pontino' (Consiglio Nazionale delle Ricerche, Commissione per i Fertilizzanti, Rome, 1934.)

other schemes because of the deep personal interest taken in it by Signor Mussolini, who frequently visits the region and has a personal knowledge of its problems.

Libya

The colonization of Libya—"Quarta Sponda" as the Italians call it—proceeded on the same lines as that of the Pontine Marshes, but it started later and so benefited by the experience already gained. The region stretches along the north coast of Africa from Ras Agedir in the west to the Bomba Gulf in the east. It has been in the possession of Italy since 5 October 1912, when it was taken from the Turks. The name is ancient, but was formerly applied to the region east of the Sahara: it was revived by Minutilli.[1] The country falls into four divisions: Tripolitania in the north-west (two provinces, Tripoli and Misurata); Cirenaica in the north-east (two provinces, Bengasi and Derna); Fezzan in the south-west; and the Libyan desert, relieved by the Oasis of Cufra, in the south-east; this southern part is South Libya, its chief

town being Hon. Colonization is restricted to the low-lying coastal region, but the inland region plays an essential part because the Arabs displaced by the colonization schemes are transferred there. The colonies are in two groups: one in Tripolitania, the other in Cirenaica; they are separated by the Gulf of Sirte, which cuts deeply in between them. From this coastal region the country steps up in terraces or plateaux to the higher parts of the interior: there are no regular mountain chains, but the cretaceous foundation of the coastal area forms low bare hills.

In classical times the country supported a considerable population, as shown by the remains of the great cities Leptis Magna, Sabratha, and others, and their richly adorned buildings show that they possessed considerable wealth which could only have come from the soil, as there are no important mineral resources. It produced and exported to Rome large quantities of wheat [2] and also of olive oil, as shown by the remains of stone oil presses and

[1] F. Minutilli, 'La Tripolitana' (Torino, 1912, p. 8).

[2] The tradition of a fertile Libya is very ancient. Homer (*Odyssey*, Bk. IV, lines 85 *et seq.*) speaks of "Libya, where the ewes bring forth their lambs with horns on and bear them thrice in the cycle of each year. No Libyan, be he lord or shepherd, goes short of cheese or meat or sweet ewe milk, for the flocks give milk all the year round."

by the arrangements for shipping the oil to Rome, said to have involved the construction of a great duct along which the oil was run on to the boats. Further, the city baths must have needed considerable fuel, indicating large supplies of wood. After the Roman and Byzantine periods however the country was left uncared for, and blowing sand gradually obliterated all marks of civilization.

The climate of this coastal region used for Italian colonization is Mediterranean in type: cool, wet winters and hot, dry summers. The mean temperature in January is 50–60° F.; in July and August it is 80° F. The rain comes mostly between November and March; April to October are dry months. It is at a maximum (350–400 millimetres per annum) on the two horns of the Gulf of Sirte, around Tripoli and Gebel el-Achdar respectively; it decreases rapidly as one passes inland, and within a few miles of the base of the Gulf it is below 50 millimetres per annum. The Tripolitan colonies are mostly in the zone of 200–300 millimetres rainfall, those of Cirenaica have rather more; some have more than 400 millimetres. But as in other semi-arid countries the rainfall is erratic.[1] There are no regular rivers, but only the torrent streams called "wadis" by the Arabs. The wind see-saws from sea to desert, carrying always sand, which necessitates shelter belts for the crops and at times causes some discomfort by getting into the eyes and leading to a certain amount of trachoma among the colonists.

The native vegetation of the coastal area is of the steppe type, chiefly low bushes (*Ziziphus lotus*, etc.) and herbaceous plants which afford a limited amount of sustenance to grazing animals. One sees stretches of asphodel, and on the sand-hills there are sand-binding grasses and bushes of white broom. A considerable proportion of the native population is nomadic, and one sees the large, low tents in the stretches between the colonies. In the oases where water is available a settled agriculture is adopted by the Arabs; date-palms (*Phoenix dactylifera* L.) are grown, and under and about them are patches of irrigated wheat, lucerne, and other crops. These date-palms are among the most characteristic features of the Arab settlements, as the Italians do not grow them.

The modern Italian colonization of Libya began under Count Volpi in 1923 on a plantation basis. The purpose was the agricultural development of the country; the capital was to be provided from Italy, but the labour was to be native. A fundamental change was made in 1928 by Marshal Emilio de Bono, who established a law to the effect that the purpose was to be the settlement of Italian colonists in Libya. This idea was further developed by Marshal Badoglio. On the original plan the Government had taken over great tracts of land, compensating, where deemed necessary, the former owners or tribes possessing grazing rights; these lands were then handed over to large exploiting organizations which were required to employ certain numbers or groups of Italian workers procured in association with the Commissariat for Interior Migrations. These organizations did useful work in showing what could be produced on the land they held, but they failed to encourage any great migration of peasants; at the Census taken in April 1937

[1] For an account of the rainfall of Libya, see A. Fàntoli, "Elementi preliminari della pluviometria libica," *L'Agricoltura Coloniale* 33 (1939) 1–27.

there were 124,000 hectares taken up, but only 79,000 operated and the total number of Italian families was only 1300, mostly wage earners. It looked as if the result would be simply to establish *latifundia* in Libya, and this did not at all accord with Fascist intentions; a much more rapid colonization was desired. As Nino Falchi expressed it: "la colonisation intensive garantit de mieux en mieux la fonction proéminente qu'assume la Libye dans le système méditerranéen et pour le contrôle du continent africain." [1] Economic and financial aspects, as before, occupied a minor place as compared with the political and social motives.[2] The first efforts were made by Luigi Razza in Cirenaica, who started an organization, the *Ente di Colonizzazione per la Cirenaica*, to encourage mass colonization into that part of Libya. The conception of race purity was introduced and the operation is called "demographic colonization." But the final determining step was taken when the energetic and enthusiastic Marshal Italo Balbo, who had been appointed Governor of Libya in 1933, himself decided to take the matter in hand, and was given wide powers and a large grant (500 million lire) by the Council of Ministers in April 1938. He has himself recently given an account of what he did then, and his breathless activity makes a fascinating story.[3] By June 1938 he had added to the Public Domains some 500,000 hectares, so that they now amounted to over 246,000 hectares in west Libya and nearly 492,000 hectares in eastern Libya. Of course not all of this is available for colonization: the rocky parts must be afforested, and the dunes fixed and planted. He expanded Razza's corporation into an *Ente* for all Libya—*Ente per la Colonizzazione della Libia*—but as the Fascist philosophy does not exclude emulation, indeed recognizes its advantages, he invited the collaboration of another body, a provident society, *L'Istituto Nazionale Fascista per la Previdenza Sociale*, to found other villages: Bianchi, Giordani, and Oliveti. The division of duties between the Government and the *Ente* is as follows:

The Government acquires the land and incorporates it into the Public Domains. It constructs the roads and aqueducts, notably the great one in Tripolitania 80 kilometres long, supplying 24,000 cubic metres of water daily, and the even larger one in Cirenaica, 150 kilometres long, delivering 96,000 cubic metres daily: these are based on an allowance of 100 litres of water per head per day. Further, the Government constructs the artesian wells and the public buildings in the towns. It appoints a technical Commission to decide the general lines of cropping and therefore the size and character of the farms and their buildings; the number of years necessary for the working up of the farm, the maximum being five; the relation between the irrigated and the dry cultures; the number of families to be introduced into each zone; and the price at which the colonist is to buy his farm. It then hands the land over to the *Ente* which now takes charge, lays out the farms and builds the houses according to the plan. The *Ente* uses its own funds for this purpose: thus

[1] Nino Falchi, *Le Travail Agricole*, vol. 1, p. 80. Rome, 1939.

[2] For a full discussion, see Armando Maugini, "Impressioni sull'agricoltura dell' Impero," *L'Agricoltura Coloniale* 33 (1939) 114, and also VIIIth International Congress of Tropical and Sub-Tropical Agriculture, Tripoli, 1939.

[3] Italo Balbo, "Coloni in Libia," *Nuova Antologia* 73 (1938) 3–13; also as a pamphlet in French, 'Colons en Libye,' Maggi, Tripoli, n.d.

the Provident Society uses the contributions made for purposes of sickness, unemployment, and old age benefit.

Two important factors needed special attention. In almost any part of Africa water supply is apt to be the limiting factor in crop production, and Libya is no exception. The rainfall is inadequate for any intensive agriculture, and the absence of permanent rivers makes canal irrigation impossible. Marshal Balbo attacked this problem vigorously and ordered a water survey. This showed the presence of considerable quantities of underground water in two tables, one near the surface but not very abundant, another several hundred metres deep which was not only abundant but under pressure, so that the water rises to the surface or may even jet out to a height of several feet. This underground water is tapped and used for irrigation.

The other factor was social. The whole enterprise, in the Marshal's own words, was to be "una grandiosa opera di colonizzazione, su un territorio che fa parte integrante della Patria, a esclusivo beneficio della Patria, sotto le insegne della Patria fascista." [1] Its agriculture must therefore not compete with that of Italy, but only operate as a supplement. For political reasons the colonists must be numerous, and for social and economic reasons they must be consumer-producers, working a subsistence agriculture and exporting to Italy only such commodities as must in any case be brought in from outside. Of these olive oil is one of the chief: Italy produces so small a proportion of her total consumption that there is a considerable importation from Tunis and Greece and in the north a good deal of linseed oil has to be used instead. The limitation does not press harshly on the colonists as a large army is maintained in Libya, making a considerable home market. Indeed so far there has been little question of exports, and the country is not yet self-supporting.

By October 1938 matters were so far forward that the first great batch of colonists could be brought in. It was done in the grand style: seventeen ships brought in some 20,000 colonists from the crowded regions of the Po valley and elsewhere; they included 1800 families averaging about nine persons per family, but so chosen that more might be expected; all had been passed as medically fit and approved by the competent authorities as morally and politically sound. They were taken in lorries to their new homes, where each family found a complete farm with barns, implements, and livestock, and a house with the heavy furniture in place—beds, cupboards, tables, chairs; and, final touch of paternal solicitude, a meal awaited them. Even more important still, the Marshal himself shows a personal interest in each family; he visits the colonies, calls at the houses and speaks with the people, inviting them to lay before him any difficulties or complaints.

Fresh colonies are being vigorously laid out and the work was proceeding actively at the time of my visit in March 1939. Six hundred colonists were on our ship: on arrival at Tripoli they were marched through the streets with band playing and flags flying, then put on lorries to be dispatched to their villages. Early in 1939 there were already 2450 holdings in existence, of which 1800 were fully equipped.

The cost of these 1800 holdings is estimated by Signor Falchi at about 500 million lire, made up as follows: public works, 130 million; farms

[1] *Loc. cit.*

and houses, 370 million; towards the latter there is a State contribution of 81 million lire.

By the end of 1939 it is hoped to have brought in another 20,000 colonists from Italy and to have 3100 holdings ready, of which 1580 will have been set up by the *Ente per la Colonizzazione della Libia*, and 1520 by *L'Istituto Nazionale Fascista per la Previdenza Sociale.*[1] The expenditure for the 1939 programme is estimated at about 450 million lire. On arrival at his farm each colonist is given an estate account book in which is set out, on the debit side, the sums expended on the farm, the house, and the buildings, and the payments made to him [2]; and on the credit side, an allowance of 30 per cent. given by the Government.

The *Ente* has brought the colonist here and the *Ente* looks after him and tells him what to do. For the first twelve months he is paid a wage sufficient to maintain the family, and during this time he must continue the making of the farm, sow and tend the crops, and look after the animals. The amounts paid are entered on the debit side in the estate account book. At the end of the twelve months the colonist has reaped his crops and need no longer continue to receive wages. He has as yet however no working capital. He therefore becomes a metayer, or share partner with the *Ente:* it provides seed, manure, implements, and other necessary items and advances, and lays down the cropping scheme and gives advice; he provides labour. At harvest time half the produce goes to the *Ente*, half he keeps himself. Gradually his position improves, and after about five years he ceases to be a metayer and becomes independent in the sense that he has all the crop but of course gets no help from the *Ente;* instead he must now start paying a rent which includes interest and sinking fund on the basis of repayment in twenty-five or thirty years, but he must still crop as instructed.[3] At the end of that period the holding is his own and he passes out of the *Ente's* care, but he will then come under another organization. These activities necessitate a considerable staff, and men for the purpose are obtained from the Middle Schools of Agriculture and from the Universities.[4] The justification offered is that the Government has put very much money into agricultural development and it must keep a tight hold on the machine it has so carefully created. If the individual were allowed to grow what he pleased in whatever way he pleased the whole scheme might end in financial disaster. He must therefore accept discipline.[5]

[1] For full details see Nino Falchi, "Le peuplement rural des provinces libyques," *Le Travail Agricole* 2 (1939) 80–106; also 'Notes relatives aux principes, méthodes et finalités du nouveau plan de colonisation de la Libye,' Maggi, Tripoli, 1939.

[2] But there is no charge for interest or administrative expenditure.

[3] For details of the contract see 'Notes relative aux principes, méthodes et finalités du nouveau plan de colonisation de la Libye,' p. 16. Maggi, Tripoli, 1939.

[4] The Syndicalist organisation of these technical advisors is described by Count Livio Gaetani in *Le Travail Agricole*, 1938, Special No., pp. 63–71.

[5] His instructions are thus set out: "Il Colono: 1. Deve essere disciplinato e considerarsi mobilitato per una gloriosa battaglia. Il colono deve anzitutto sentirsi soldato, milite di una grande battaglia, combattuta sopratutto per sè e per i propri figli; e come soldato deve sentire l'orgoglio della propria disciplina e del proprio lavoro. Primo requisito del colono quindi sarà disciplina assoluta, subordinazione e consapevole attaccamento al proprio lavoro. 2. Deve sempre ricordare che lavora, non per altri, ma per sè e per un migliore avvenire dei propri figli." (Ente per la Colonizzazione della Libia: 'Note istruttive per i Coloni,' Tripoli.)

5. Fixation of sand dunes, Tripoli: small hedges of dead Imperata, with a tree in each compartment

6. Fixation of sand dunes, Tripoli: second stage, with trees about nine years old

7. Tripoli oasis: irrigated citrus

8. Tripoli oasis: dry-farmed olives and almonds

Three types of farms have been laid out, depending on the amount of water:

(i) *Adequate water supply* (Crispi, Gioda, south of Misurata): total area of each farm 15 hectares; irrigated area 10–12 hectares (ultimate intention); dry cultures 3–5 hectares.

(ii) *Less water available* (Oliveti, Giordani, west of Tripoli): total area 25–30 hectares; irrigated area 5–6 hectares; dry cultures 20–25 hectares.

(iii) *Little or no irrigation:* 30–50 hectares, according to rainfall; 30 hectares in the Gebel Vert (Cirenaica) and 50 hectares in the Breviglieri district where the rainfall is lower.[1]

The colonies east of Tripoli. The journey to Crispi and Gioda is easily made by car from Tripoli. The road is excellent and it is fringed with Australian trees, especially *Eucalyptus rostrata* Schlecht. and *Acacia linearis* Sims (L.),[2] which here do very well. It skirts the coast and passes first through some of the older so-called "capitalistic" farms, some of which are as much as 1000 hectares in extent; they grow much fruit and are well laid out. Farther on the road passes through the steppe vegetation: the low shrubs and herbaceous plants already mentioned, but with occasional great stretches of asphodel. Then it passes through sand-dunes now in process of being fixed. One effective method is to make little square enclosures about 2 metres square by sticking in pieces of a dead rush-like plant, *Imperata cylindrica*, then to plant the young tree in the centre (Plate 5). Under the protection given by the *Imperata* the tree is able to establish itself. Forty kilometres east of Tripoli we saw a plantation made in 1930 and now well established: it included *Robinia pseudacacia*, *Thuja*, *Cupressus* on the sand; and *Acacia saligna*, *Eucalyptus rostrata*, *Pinus halepensis* Mill, and *Tamarix articulata* Vahl on the more solid ground (Plate 6). The goat trouble, so serious in Palestine, does not exist here. Still farther on, at 80 kilometres, is a hill, Garz Chiar, from the top of which an excellent view is obtained over the whole plain, now steppe and dune, but one day, it is hoped, to be colonized. Then at 120 kilometres we reach the remains of Leptis Magna, greatest of Libyan cities in Roman times, adorned and enriched by the Emperor Severus, who was born there. Farther on is a walled Arab town, Zliten, with a picturesque market for native products, pots, mats, etc.; good rugs can be bought here, though in general no high degree of craftsmanship is seen. The road still continues eastwards to the oasis of Misurata (217 kilometres) at the western horn of the Gulf of Sirte; it then turns sharply south, still following the coast, to the new town of Crispi, which is barely a year old.

Like the Pontine towns, Crispi has been laid out by a competent architect who has designed the buildings to form a harmonious whole: they are in the modern style, mostly rectangular: the effect is obtained by posing one mass on another. The church as usual dominates the town; there are also large

[1] For details of cropping schemes see 'Notes relatives aux principes, méthodes et finalités du nouveau plan de colonisation de la Libye,' Maggi, Tripoli, 1939. Olive culture is discussed by G. Vivoli, "Principali aspetti e problemi dell'olivicoltura in Libia," *Annali Cent. Sper. Agrar. Zootec. Libia* 1 (1938) 1939, 119–52.

[2] I am indebted to my colleague and fellow traveller, Sir Arthur Hill, for the identifications.

buildings for the municipal authorities, the Party, and the *Ente*, a school for 250 children, a small hospital with doctor, nurse, midwife, etc. There is a large cooperative store well stocked and with much tinned provisions. Cooperative stores are an essential feature of the scheme and indeed throughout Italy: they were set up here to avoid any possibility of speculation in foodstuffs. All their trading should be with the Central Wholesale Store at Milan, but the rule was, I was told, sometimes relaxed where direct importation would result in lower prices. The prices are fixed by a commission in Tripoli controlled by the Government; a local official sees that the decisions are obeyed. The houses are not numerous, but they are comfortable; they are intended for the officials.

The farms are 15 hectares, of which up to ten will be irrigated when the scheme is complete. Cement irrigation channels are laid on to each farm for the purpose of bringing the water from the central artesian wells that supply the whole group. There are sixteen of these wells to water an area of 4600 hectares; their average depth is 400 metres and their average supply 300 cubic metres hourly.

The scheme aims at a water supply of 250 cubic metres per farm per day[1]; each well is expected to water thirty farms, but this assumes that the demand can be uniformly spread: it remains to be seen how far this is possible. The water is slightly brackish, containing 0·33 per cent. of total solids, chiefly chlorides; it is quite safe for stock and for all the crops proposed, so long as salt does not accumulate in the soil. It is too salty for citrus fruits, and these will not be grown here. Special arrangements are made for collecting rainwater for drinking.

The irrigated crops are chiefly wheat, some horticultural and industrial crops, lucerne and grass for livestock; it is hoped ultimately to have five or six cows per farm. About 1 hectare will be devoted to industrial crops; cotton (upland type) is being tried, but it is too soon to say whether it will succeed; tobacco is also grown and some citrus fruits (Plate 7).

The rainfall (about 150 millimetres per annum) suffices for olive trees, almonds, and vines grown for wine, and the prospects for olives are considered good. Already some $3\frac{1}{2}$ million olive trees are planted in Libya, and it is intended to plant still more. Some 5 hectares of the permanently unirrigated land on each farm are planted with olives at 20 metres by 20 metres, and they do very well (Plate 8).

The houses are well built and, as in certain other directions, based on the old Roman design[2]: a description of one will suffice. It had three rooms, the one in the centre was a living-room, the two at the sides were bedrooms. The floors were tiled, the walls of white cement, the heavy furniture consisted of two tables, two cupboards, two beds, all of thick wood painted green. Beyond this the occupiers had little; there was nothing on the floor, no ornaments or

[1] An average of 7·5 centimetres per month over the 10 hectares. In the United States wheat is given about 50 centimetres and lucerne about 100 centimetres during the season. Details of the water requirements are given in "The Crispi and Gioda agricultural areas of Misurata," Ente per la Col. della Libia, Carlo Colombo, Rome, 1938. The cropping scheme is given in the "Notes" already quoted.

[2] For plans of the colonists' houses, see E. Bartolozzi, "Gli sviluppi della colonizzazione demografica intensiva in Libia," *L'Agricoltura Coloniale* 33 (1939) 57–65.

comforts; one or two religious pictures and a few photographs hung on the walls and there was a certificate showing that the man had taken part in the war of 1912 between Turkey and Italy. The woman told me they had come from Sicily and were well content with their lot; in reply to my question whether the climate suited the children she smilingly pointed to them, and the answer seemed in the affirmative. It was in any case, she said, much like Sicily except that it was warmer in summer. There was also a stable for the cattle (Plates 9 and 11).

Crispi has already 333 holdings, and Gioda, 11 kilometres farther down the road, has 98, making 431 in all.

The houses have cost about 60,000 lire, and so far as can be seen the total cost of the farms at the end of five years, when metayage ceases, will be about 140,000 lire. It is difficult to express this in English money because of the three different rates of exchange,[1] but at 100 lire to the pound the total cost is nearly £1400. The total expenditure on the farms in Libya in the 1938 programme is stated to have been [2]:

	No. of holdings	*Average cost, lire*	*Total, lire*
Eastern Libya ..	820	185,000	152,110,000
Crispi, Gioda ..	431	138,000	59,678,000
Breviglieri	232	135,000	31,320,000
Oliveti, Giordani ..	317	155,000	52,780,500
Total ..	1800		295,888,500

making a grand total cost of farms £3,000,000, at 100 lire to the pound. Once repayment begins it is to be completed in thirty years. Interest is to be reckoned at 2 per cent.: the normal rate is 5½ per cent., but the State pays the difference.

The colonies west of Tripoli. The second group of colonies lies west and south-west of Tripoli. Here the water from the second water-table does not rise to the surface but only to the level of the first table, from whence it must be pumped to ground-level. Windmills were first used as power, but electric pumps are now being installed, run by Diesel engines, the oil being imported from Italy.

The colony of Michele Bianchi is typical (Plates 10 and 12). Close by is the tree nursery named after Arnaldo Mussolini, brother of the Duce, who was greatly interested in afforestation here: great numbers of olive, citrus, and roadside trees are raised for distribution. If much tree planting occurs it will be interesting to see the effect on the water supply in the soil. In parts of Western Australia the trees transpired much of the available water and no springs broke out until they were cut down.

The farms here are 25–30 hectares, and unlike Crispi each has its own well 15–25 metres deep and yielding on the average 30 cubic metres of water per hour; it can irrigate 5 hectares. The water is sweet, not brackish. In addition

[1] In March 1939 £1=89 lire, official rate; 98 lire, tourist rate; 150 lire in the free market.

[2] 'Notes relatives aux principes, méthodes et finalités du nouveau plan de colonisation de la Libye,' Maggi, Tripoli, 1939.

to the usual crops there are tobacco, ramie, and other industrial plants. On a typical farm visited, half of this irrigated area is under wheat (Strampelli's *Mentana*) and the rest under lucerne and citrus (1 hectare). Both wheat and lucerne are sheltered by low wind-breaks of *Tamarix articulata* or of elephant grass. There were three cows, two in milk—each should give about 12 litres of milk daily (2½ gallons); also one bullock for work; some poultry, a few rabbits in hutches, no sheep and no pigs. The milk, like other products, is taken by the *Ente*. The cattle are of the brown Alpine race, which seems to give satisfactory results. In Cirenaica the *Ente* has taken over 2000 hectares of land for breeding working cattle of the Maremmana race.

The house is on the same lines as at Crispi, except that a barrel roof was used as being cheaper in construction. The colonists came from the Campagna; when they arrived the region was sand only; they and their colleagues are proud of having transformed it into a good agricultural region.

The town of Bianchi, like the other new ones, is attractive and distinctive, with the usual features, a dignified church and public buildings, a market place, a clinic, and a school. Attendance at school is compulsory between the ages of six and eleven; the parents take it in turns to bring in the children in their rubber-tyred farm carts, one man bringing in four or five lots at a time.

The district is rapidly developing, and already it has some 320 farms: Bianchi 75 farms; Giordani 115 farms; Oliveti 127 farms.

Near Oliveti we passed a good "capitalist" farm in process of conversion into small colonists' farms. From Oliveti it is only a short distance to the ruins of Sabratha, a magnificent Roman city with a theatre. Its chief significance is however as a basis for hope that the region may once again become capable of bearing a large and prosperous agricultural population.

The drier colonies. The third type of farm is seen at Breviglieri, near Tarhuna, south-east from Tripoli and 100 kilometres from it along the hill road. The area to be exploited is 8300 hectares, but it is undulating country; there are to be 230 farms, their average size about 50 hectares, *i.e.* double those at Bianchi, but although the rainfall is greater there is no possibility of irrigation. A large chart is posted up in the Central Square showing the whole plan and even giving such details as the total length of farm roads (29 kilometres). Water will be brought by aqueduct. The work was started in 1936, but it is not yet complete. The crops are olives (about 25 hectares per farm) and vines (about 5 hectares) grown without irrigation water; the grapes yield a wine which so far is inferior to Italian wine, though whether that is their fault or the fault of the maker is not yet agreed.[1]

Unfortunately I was unable to visit the colonies of Cirenaica and so shall not deal with them. There are some 500 holdings in the province of Bengasi and 326 in the province of Derna. There is no such underground water supply as in Tripolitania, but on the other hand there is a higher rainfall.

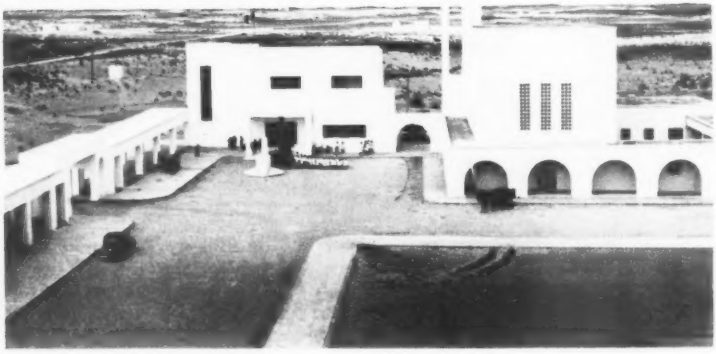
The bringing in of so many Italian colonists has naturally caused considerable displacements in the native life (Plate 13). It is expected that some 350,000 hectares will ultimately be occupied by Italian colonists, of which some 250,000 hectares had been used by the natives. I had no opportunity of

[1] See, on this subject, A. Ferrara, "La cantina sociale di Beda Littoria," *L'Agricoltura Coloniale* 32 (1938), No. 9.

9. Tripoli, Crispi: the irrigation system

10. Tripoli, Michele Bianchi: nurseries in the background

11. Crispi: colonist's house



12. Michele Bianchi: school and church

13. El Cus Sabat: native village in Tripoli

seeing personally how this operated, but three general methods of dealing with the problem have been to pay indemnities (60 million lire were set aside for this); to supply drinking water for animals at places farther inland, so that nomadic peoples who formerly kept to the coast need no longer do so; and to establish colonies like those of the Italians, under a special Muhammadan section of the *Ente per la Colonizzazione della Libia* financed by the Government out of savings banks deposits.[1] It remains to be seen how far these methods suffice.

As this Libyan colonization is by far the largest group settlement ever undertaken its progress will be watched with the deepest interest by all concerned with colonization, and certainly by many administrators in the British Empire. Several factors hold out hopes for success. Great cities flourished here in Roman times; their wealth being largely derived from agriculture, and there is no evidence of any climatic change to prevent a successful agriculture again developing. Further, there is splendid human material in the colonists. I have seen the Italian peasants at work in Queensland, where they have shown themselves at least the equal of any others in wresting a living from the soil. And in Libya the indications are no less promising.

The scientific services are admirable. They are under the general direction of Professor Armando Maugini, of Florence, and the agricultural experiment station at Sidi Mesri is under Dr. Giulio Vivoli, a shrewd and vigorous worker, while Dr. Ettore Ducros is in charge of zootechny. Finally, and it is difficult to overrate the importance of this, the keen and direct interest taken in the colonization by Marshal Balbo, and the inspiring effect of his enthusiasm on colonists and officials alike, give a force to the movement that has carried it over obstacles which might otherwise have proved insuperable.

Against all these favourable factors there are two lurking possibilities of failure. Any semi-arid region is liable on cultivation to soil erosion,[2] though in Libya the risk is diminished by the planting of trees, in which the soldiers take part, and of tamarisk and other hedges to act as wind-breaks. The other risk is the water supply. The rainfall is not great, and the rate of evaporation is high; the chalk which underlies much of the region is fissured and faulted. How much water is stored in the two water-tables? And, when the colonization is more fully developed, how long will it last? No man can answer this question: time alone will show. But one can only admire the courage of the Italian nation in boldly applying new methods to this old problem of colonization, and in setting up examples which, if they succeed, will furnish models for others to follow, and in any case bear tribute to the skill and enterprise with which a difficult problem is being attacked.

DISCUSSION

Before the paper the PRESIDENT (Field-Marshal Sir PHILIP CHETWODE) said: Sir John Russell, who is going to lecture to us to-night, is Director of the Rothamsted Experimental Station and a great expert on soil conditions and crop growing. He has also studied the wider geographical aspects of agriculture

[1] For fuller description, see Nino Falchi, *Le Travail Agricole* 2 (1939) 80–106.

[2] This question is discussed by Dr. G. R. Giglioli in "L'erosione del terreno agrario nei tropici," Istituto Agricolo Coloniale Italiano, Florence, 1938.

and settlement, and is going to tell us, first, something of the marvellous work the Italians have done in the neighbourhood of Rome, in the Pontine Marshes, and, secondly, in Libya.

Sir John Russell then read the paper printed above, and a discussion followed.

The PRESIDENT: I ask the First Secretary of the Italian Embassy, who has honoured us with his presence this evening, if he would like to make any comments.

The FIRST SECRETARY, representing the Italian Ambassador, expressed his appreciation of what Sir John Russell had said about the colonization in the Pontine Marshes and Libya.

Sir ARTHUR HILL: I had the pleasure of going with Sir John Russell to Tripoli last March: we were both delegates of our Government attending the VIIIth International Congress of Tropical and Sub-Tropical Agriculture. I should like to say now, and I am sure Sir John would endorse it, how much we were indebted to our Italian hosts for the singular kindness which they showed us on the excursions we made to the new villages in Libya. It was an international assemblage, comprising French, Belgians, Germans, Rumanians, and several other nationalities, and the whole Congress was most harmonious. It was an excellent opportunity of promoting good will among the various nations represented.

The villages, as Sir John has said, were most interesting; to me as a botanist particularly so, because nothing can be more depressing than a new village, like Crispi, only four months old: a bare sandy plain with glaring little white houses scattered over it at intervals, and hardly anything visible in the way of plants. Quite small olive or almond trees could be detected only if one walked about looking for them. And then to visit a village which had been in existence for two or more years, and to see the good growth the trees had made and the fertility of the irrigated land was a revelation of the beneficent results of good farming under conditions which looked so unpromising.

The olive trees are planted 60 feet apart on the unirrigated land, owing to the necessity of ensuring that each tree may get all the water available in the soil. The young trees look absurdly far apart, but this is essential, for if planted closer together they would not live for lack of water. When the land is irrigated however they can be planted rather more closely. It was a very interesting example of what could be achieved in such circumstances, as were also the methods adopted for sand-binding and tree-planting on the sand-dunes. Both on the sand-dunes and on the unirrigated farmlands the trees are watered for the first two years, a little water being given during the growing season, after which the trees are left to themselves. It was remarkable to see how few failures, if any, there were either among the olives or almonds or among the trees planted on the sand-dunes: a great tribute, not only to the careful work which had been done beforehand in selecting and transplanting the trees, but also to the skill of the cultivators and the organizers of the undertaking.

With regard to the asphodels, to which Sir John referred, these cover large tracts of country, but the ground on which they are growing is apparently not very suitable for agriculture, and at the moment such tracts are being left alone.

Had I not seen the work that is being done and has been done in Libya, I should certainly have been rather doubtful about believing all that I might have read or been told about this successful enterprise.

Mr. JOHN DE LA VALETTE: It gives me great pleasure to add my tribute of admiration to that already offered to Sir John for his most interesting lecture.

I quite agree with what Sir Arthur Hill said, that nobody who has not seen what has been done can quite believe these things are true.

I have not had the privilege of being in Libya since the Italian occupation, but I have seen a great deal of reclamation in many parts of Italy, and I think the most interesting impression one gets was expressed in the words used by Signor Mussolini and quoted by Sir John Russell: that the object of land reclamation is "to reclaim the land, and with the land the men, and with the men the race." In other words, it is a human endeavour, and that conception percolates through the whole system.

There is another aspect of land reclamation which struck me in many parts of Italy; it is not a centralized undertaking. It is deliberately influenced from the centre and obviously it must be, because the finance must ultimately come to a large extent, at any rate for what Sir John has called the big work that has to be undertaken, from Government sources; but even when the Government supplies anything from 80 to 90 per cent. of the finance required for certain work, the actual planning and undertaking of the work in many cases which I have looked into personally was entirely left to local *consorzii* of landowners, farmers, and others interested in developing that particular region. Thus one was more likely to get the most suitable scheme for the particular district concerned and there was more local enthusiasm for it.

I often asked what became of the obstructionist amongst the landowners, because we know that in this country, with the best intentions, certain landowners prefer a system which has long lasted to continue, rather than to introduce novelties which may not be to their liking. In Italy there are also such obstructionists, but the fact that there is this local initiative eliminates many objections and, finally, if a small minority stands out, and in the cases I have looked into the minority was extremely small, then the system has been to expropriate the land, giving the landowner such an amount of Government bonds as would secure to him the same revenue as he was getting from his land prior to any improvement.

I was much impressed by the paternal interest in the human beings who are carrying out this work. Sir John has pointed out, and I think it very important, that this is not large-scale farming; the aggregate results are very large, but the operations are those of small individual farms, working cooperatively. I believe one could perhaps produce by the use of agricultural implements and machinery the same results with far fewer hands; but I think it is to the credit of the Italian Government that they realize that the point is only partly to produce as much as possible of the produce in which Italy wishes to be self-sufficient, and that at least as big a problem is the occupying of as many hands as possible in work congenial to the particular people with whom they are dealing.

This reclamation scheme is based on gratifying the very natural and laudable instinct of the average Italian to work on his own bit of land. The fact that he can ultimately become the owner, as Sir John Russell pointed out, is a real inducement to the Italian to devote the labour of himself and his family to the work. If there is one thing which we in Great Britain might not only admire but seriously consider for the lesson it contains, it is this: the devotion of public works not only to the national benefit, but to the welfare of individuals taken as individuals and not merely as part of the colossal nameless mass. Sir John Russell's paper has brought out that extremely important aspect, and I for one am most grateful for all I have learned to-night in that connection.

The PRESIDENT: In asking you to thank Sir John Russell for one of the most interesting lectures we have had in this Society for a long time past, I would like to say how much it should interest us, because we are not only a great

colonizing race, like the Italians are rapidly becoming, but we are a great irrigating race. We have performed wonders in Egypt and in India. Those of you who have spent, as I have, the better part of your working lives in India know what that means. But curiously enough we have a totally different problem in India from that which may or may not confront Italy.

Italy has had to get rid of water round about Rome. She has taken good care to get rid of it so that it will not come back unless she wants it. We in India have to produce water at great expense and fairly easily, because we get it from the snows of the great mountains; but we are now, as some of you may know, spending almost as much as we spent on irrigation of the Punjab in getting rid of the surplus water which we put into it. We are suffering from what is known as subsoil saturation, and we have had to spend many crores of rupees in digging drains to get rid of the water which we first of all put in to get crops established. We shall all watch with the greatest interest to see whether the pressure water the Italians are now getting in Libya is going to last or not. I ask you to thank the lecturer in the usual manner for a most interesting evening.

THE IRRAWADDY PLATEAU

F. KINGDON WARD

AT the end of June 1937 I left railhead at Myitkyina in Burma on a third journey to the sources of the Irrawaddy. Nowadays there is a cart road (passable for motors in the dry season) to Sumpra Bum, 139 miles from Myitkyina, and I was able to hire three bullock carts for the first half of the journey to Putao; a form of transport which, though very slow, has advantages in the moist heat of July.

That part of Burma which extends north from Myitkyina and the Irrawaddy confluence to the Tibetan frontier is different from any other part of the country. It lies entirely outside the tropics. It is very mountainous and is traversed by tempestuous rivers. Rain falls at all seasons of the year, but mostly in the summer. The valleys and lower hill ranges are covered with tropical and sub-tropical evergreen rain forest instead of monsoon (deciduous) forest, as over a great part of Burma. This evergreen forest passes into sub-tropical pine forest at about 5000 feet, and that in turn into evergreen conifer forest above 8000 feet. Thus it is convenient to distinguish this large region as north Burma, distinct from Upper Burma, with which it has little in common. The distinction is more than academic. Upper Burma is essentially the valley of the middle Irrawaddy and lower Chindwin. It lies within the "dry zone" and consists almost entirely of plains covered with thorn forest and tropical dry deciduous forest.

The rainfall of north Burma varies greatly within a few miles, and from year to year. Actually in the hills it is probably never less than 100 inches, except in the extreme north; although Myitkyina itself, which is on the plain, has an average of about 75 inches. Temperatures are even more fluctuating, and in the north, where the valleys are deep and the mountains high and precipitous, exhibit violent contrasts. The one meteorological factor, and that the most important for plant life, which does not vary greatly is atmospheric humidity. This is always high, except locally, even in the winter. It probably never falls below 75 per cent. of saturation, and for long periods is 90 per cent. or higher.

Although surveyed, north Burma is, in the modern sense, almost unexplored. Mr. J. K. Stanford, who while Deputy Commissioner of the Myitkyina district from 1932 to 1936 made the most complete collection of birds yet obtained in north Burma (comprising 472 species), writes [1]: "It can safely be said that naturalists have so far only guessed at the immense wealth of bird life in Myitkyina by recording what comes up to the surface, as it were, of an enormous sea of some of the densest and least-known jungle in the world." So much for the avifauna, and the same is at least equally true of the mammal life. Of the flora we have only scratched the surface sufficiently to prove that it is very large and, as might be expected both from the situation of north Burma and from the diversity of physical features and climate, extremely varied. So far as I can trace, the following appear to be the only comprehensive botanical collections made in the district.

[1] J. K. Stanford, "On the birds of northern Burma," Part I. *Ibis*, January 1938.

In 1897 Captain Pottinger travelled up the 'Nmai Hka to the Laking Hka and made a valuable collection of plants, the first ever obtained from this region, if we except a few specimens collected by Prince Henry of Orleans on his famous journey from Tonkin to India two years before. Unluckily Pottinger got into trouble with the Maru tribes, and was compelled to leave hastily, abandoning much of his collection.

In 1916 Dr. Handel-Mazetti, of Vienna, who had been botanizing for some time in Yunnan, crossed the Salween–Irrawaddy divide and reached the Taron. In the course of a short but brilliant journey, he made a large collection in north Burma, adding greatly to knowledge of the flora.

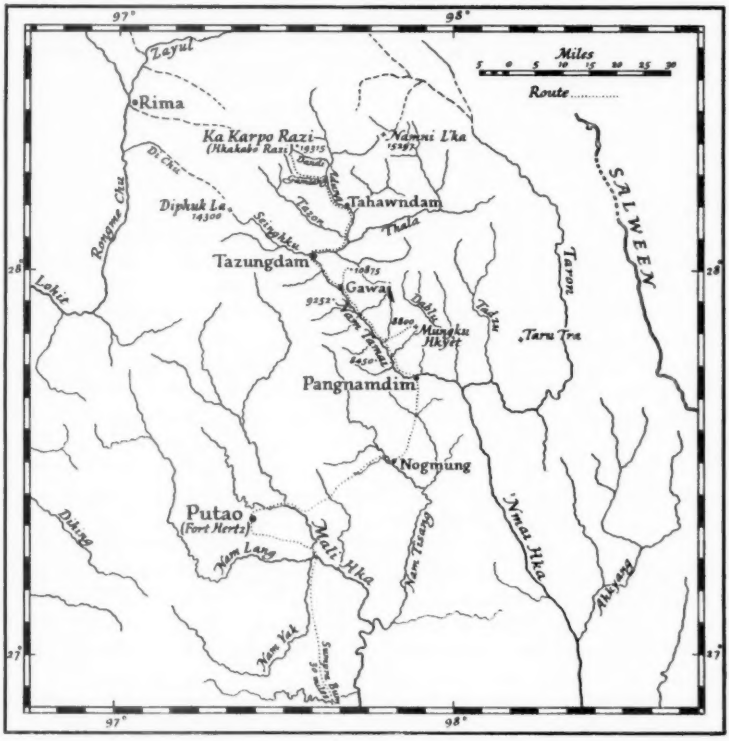
In 1919 the late Reginald Farrer and Mr. E. H. M. Cox collected in the Hpimaw area on the Yunnan frontier; and in the same year I also collected there, having in 1914 already made a small collection.

In 1920 Farrer collected in the Ahkyang valley, farther north, but owing to his death in the course of this expedition, most of the collection was lost. In 1926 I collected in the Seinghku valley, in the extreme north; and in 1931, with Lord Cranbrook, in the adjacent Adung valley still farther north, while at the same time Cranbrook made one of the best collections of birds and mammals ever obtained on the frontier. In 1937 I again visited the Tamai and Adung valleys, making a large collection. In the spring of 1938 Mr. C. W. D. Kermode, and in the winter of 1938–39 the Vernay-Cutting expedition, collected in the Htawgaw Hills, adding much to our knowledge.

In the course of his many expeditions in Yunnan between 1904 and 1931, the late George Forrest frequently sent native collectors to the Salween–Irrawaddy divide and many of his plants were obtained from the Burma side of the frontier. His north Burma collections may possibly equal those of all other collections combined. Many of his specimens labelled Tibet probably came from north Burma.

My object was a twofold one. First, to explore botanically some of the lower ranges north-east of Fort Hertz. These ranges project southwards from the snow range at the sources of the Irrawaddy and attain altitudes of 10,000–12,000 feet. But whereas the snow ranges which rise to over 19,000 feet and connect the Himalaya in the west with the mountains of China in the east have a flora closely related to both, the southern spurs, projecting far down into the Indo-Malayan region and well off the main east-to-west stream of plant migration, might, I suspected, support a rather different flora. Here the Himalayan ice age has caused a north-to-south migration of the flora followed by a fresh immigration from the south. Except along the Chinese frontier the mountains south of 28° are on the whole too low to support an alpine flora, but too high for a tropical flora such as the Indo-Malayan. They carry a temperate flora related to both. There are however isolated peaks of 12,000–14,000 feet which are as it were national parks for the preservation of some of the rarer alpine plants. Thus whereas the cross range in about lat. 28° 30′ forms a link between east and west, helping to establish the uniformity of the Sino-Himalayan botanical region, the southern ridges show a mingling of warm temperate, Himalayan, and Chinese with Indo-Malayan plants advancing up the moist warm valleys separating ridge from ridge. On the cross range which, biologically, is an eastward extension of the Himalaya, the

flora has moved mainly in an east–west direction. Most of the characteristic Sino-Himalayan genera occur here, *e.g. Notholirion, Nomocharis, Cremanthodium, Berneuxia, Paraquilegia, Cyananthus, Omphalogramma*; and though some of the species are endemics, the alpine flora as a whole is typically Himalayan and Chinese. The southern ridges west of 98° 30′ run down to the plains, and much of the alpine flora which followed this route during the Himalayan glaciation must have perished. East of 98° 30′ however the mountains are higher, so that a steady southward migration could be maintained



until Malaysia was reached. On the Chinese frontier to-day, the Salween–Irrawaddy divide is high enough to carry a typical Sino-Himalayan alpine flora as far south as Hpimaw (lat. 26°); but mixed with it are also a few north Burma endemics.

Thus there was good reason to believe that between 7000 and 10,000 feet altitude on the southern spurs I should find a flora in many respects more interesting than that of the Seinghku and Adung valleys. This belief was justified.

My second object was to reconnoitre the approaches to Hkakabo Razi,[1] the

[1] See p. 299.

highest mountain in Burma, which no doubt will one day attract a climbing party.

At first sight the evergreen rain forest of north Burma seems to be composed of an almost infinite number of species. Closer inspection corrects this view; but the variety is very great. There are probably two hundred species of large trees, besides shrubs, climbers, and bamboos, in the hill jungle. Nevertheless certain species constantly recur and are obviously dominant. At any season of the year particular trees become conspicuous in the forest by reason of some marked feature of flower, fruit, or foliage, or as the haunt of certain species of birds. In July, from the moment we entered the hills north of the Irrawaddy confluence, 40 miles above Myitkyina, two Dipterocarps, *Dipterocarpus alatus*, which was in flower, and *Shorea* sp., were easily recognized as amongst the dominant trees. Others were *Talauma Hodgsonii* and *Stereospermum chelonoides*, both smaller trees. In December *Terminalia myriocarpa*, conspicuous for its brilliant red fruits, was seen to be extremely common. Many other trees, notably species of fig, and probably also species of *Lagerstroemia* and *Garcinia*, are equally abundant. These are mostly big trees and are widely spread over the Indo-Malayan region. Amongst those I was able to identify, all recurred over and over again, more or less evenly spaced within their altitude limits, for 300 miles from where we entered the hills to where we crossed the divide between the western and eastern Irrawaddy valleys north-east of Putao. One may conclude that the western Irrawaddy region has enjoyed stable conditions of climate over a considerable period.

On July 9 I reached Sumpra Bum, headquarters of a subdivision. Here I had to abandon my bullock carts, as this is the end of the cart road. Neither mules nor ponies are to be had during the rainy season; even bullocks were not available, and I engaged Kachin coolies, who, having no work to do in the rains, are always glad to earn a little money. We left Sumpra Bum, where I had been hospitably entertained by the subdivisional officer, Mr. McGuinness, on July 14, arriving in Putao on the 22nd. The weather was hot and sticky, but little rain fell, and that mostly at night. In fact we had struck a well-marked break in the monsoon for the first part of our journey. There was a solitary Englishman in Putao, Major H. G. P. Stubbs, acting as post commandant and subdivisional officer at the same time; to his hospitality and help I owed much.

On July 28 I left Putao on the more difficult march across the hills to the Nam Tamai, reached on August 7. Although the range separating the western and eastern valleys of the Irrawaddy averages under 10,000 feet, it nevertheless marks a distinct break in the flora, probably also in the avifauna. The flora now becomes less markedly Indo-Malayan, more Himalayan and Chinese.

My first objective was the eastern watershed of the Tamai river. This range averages 10,000–12,000 feet at a distance of 40 miles south of the cross range. It separates the Tamai valley from that of its tributary the Dablu, and except for a few rocky peaks is covered everywhere with dense forest. Nowhere does it reach the alpine region, although many alpine plants grow on the exposed and wind-swept ridges, and at the heads of gullies, above the critical altitude for alpine species.

In the second half of August I spent ten days in the moss forest above 8000 feet, and made several trips to the Mungku Hkyet, at the top of the divide, which is here 9000–10,000 feet high. *Hkyet* means pass, but there is no way down the tremendous cliffs into the valley of the Dablu by this one. It is a mere notch on the sharp ridge. The moss forest is composed of temperate evergreen and deciduous trees common to the entire cool moist zone which stretches from the eastern Himalaya across the Assam valley and north Burma to western China, south of the line of snow peaks. The ridge, which just reaches the first silver firs, is too exposed to support forest, and is covered instead with a dense growth of "cane-brake" (*Arundinaria* sp.) and smaller grass, in which grow dwarf rhododendrons, a *Nomocharis* (or lily; it was not in flower), *Gaultheria*, and other small shrubs.

It was pleasant to be out of the heat of the Tamai valley for a few days, for during the three summer months it can be very trying. But it cannot be said that the moss forest in August is a perfect holiday resort. One lives in a perpetual cool mist bath, breathing almost as much water as air; and the steady drip from the trees is depressing. Returning to the valley, I sought another route to the top of the divide farther north, where it was higher. There are two or three triangulated points on the watershed, and in the fine weather of early winter Daru hunters go up into the mountains after game, such as goural and serow. Continuing another three marches up the Tamai valley therefore in a north-westerly direction, I learnt that it was possible to reach a point on the watershed at over 10,000 feet. For the first day's climb at any rate a path would have to be cut through the dense jungle; and three men formed the advance party to blaze a trail. We followed a day later.

We climbed straight up the steep mountainside to a ridge the crest of which we followed the whole way. As in the previous ascent all the stiff climbing came in the first two days, and especially on the first day, when we climbed about 3000 feet by a succession of abrupt escarpments. On the second day we climbed some 2000 feet. Then the slope eased off considerably, and an ascent of about 1000 feet brought us to the top of the divide. The trouble here was lack of water, as on so many of these north Burma mountain tops; a strange paradox in so wet a climate and one which emphasizes the astonishing steepness of the mountains. There was little room to pitch a tent here, but we cleared a space in the cane-brake. We were not actually in the alpine region, that is to say above the tree-line, but the dominant trees, silver fir and *Rhododendron arizelum*, avoided the crest of the ridge, which was clothed with *Arundinaria* and scrub, mostly small rhododendrons of many species. As it was, the topmost fir trees were stunted and deformed, less than 10 feet high, though they bore abundant cones. Nevertheless we were well above the critical altitude for alpine flowers, which occupied any space unsuitable for the climax forest. An open gully on the north face, the ridge itself, and every cliff proved good hunting ground for the botanist. Here grew such plants as *Primula Agleniana*, *Vaccinium modestum*, *Omphalogramma*, and *Nomocharis*, also a beautiful little *Allium*, *Meconopsis villosa*, and several dwarf rhododendrons. But few of these were in flower so late in the season. The number of rhododendron species was astonishing, and between 7000 and 10,000 feet I found twenty-five species in a few days. Lower down in the

forest two epiphytic species were in flower. On the whole the flora was quite different from that of the higher mountains to the north, with more endemic species, and between 7000 and 8000 feet with a larger proportion of species allied to Indo-Malayan forms.

Returning to the Tamai I started up the Adung river, which is the local name for it above the Seinghku confluence, towards the snow range. In the course of the next three weeks I reached the Gamlang stream, which flows in a deep gorge from the snow mountains to join the Adung. Marching up the gorge I eventually reached the south-east face of the main range. Here I need only say that there seems to be no possible route up the nearly vertical cliffs on this side; and the sabre-toothed ridge above, whence I thought the main peak might be reached from the south, looks even more impossible.[1]

During the ten days of October that I was in the Gamlang valley I found many alpine flowers, all of which belonged to the Sino-Himalayan flora. Except for two or three new species of rhododendron I did not see a single species which I had not seen before on the ranges to east or west of the Irrawaddy. One curious fact is worth recording. All the mountains along the frontier are heavily glaciated, as seen at the Diphuk La (head of the Seinghku valley), Namni L'ka (head of the Adung valley), and elsewhere. But except on Hkakabo Razi and its satellite peaks, hardly a glacier remains. In every alpine valley however there are permanent snow beds, sometimes as low as 9000 feet, formed by the annual avalanches shot down the steep gullies in early spring. The weight of snow which survives melting does not exert enough pressure to form ice even in the lowest strata of the beds. Nevertheless they survive all the year round, and the snow continues to melt till about the end of October, after which fresh snow begins to fall. In the following spring what remains of the bed is covered by fresh avalanches, burying a mass of soil and stones in which vast numbers of seeds are included.

As long as the snow is melting, sometimes up to the end of October if it happens to be a fine month, and into November at 10,000 feet, alpine plants which have lain snugly in cold storage for months will blossom when exposed to the light and warmth of the sun. Many of them normally flower in June, with the melting of the snow in the ordinary way. But at that time those which lie beneath the avalanche snow beds are buried deep. However, throughout the summer and autumn as fast as the snow melts seeds germinate and perennials come into flower. The paradox reaches its climax in October when plants whose normal flowering season is three months earlier are found in full bloom. These are not ephemeral plants, such as the English *Veronica arvensis*, which flower and seed the year round. Alpine plants flower and set seed at definite seasons; so that an alpine valley in north Burma for instance presents two quite distinct aspects; a spring aspect, when the rhododendrons and primulas are in bloom, and an autumn one when the gentians and cyananthuses are in bloom.

Thus it was that in the Gamlang valley on October 1 I saw a strange sight. At about 12,000 feet altitude, on one side of a snow bed the following were in full bloom: *Primula sikkimensis*, *Meconopsis betonicifolia* var. *pratensis*,

[1] For an account of the southern approaches to this mountain, see *Himalayan Journal*, 1939.

The Nam Tisang at Nogmung: low water

Large trees of rain forest killed by cutting down shelter trees, Irrawaddy valley

Looking west from 10,000-foot ridge to the Irrawaddy plateau: Nam Tamai valley in foreground

Trollius yunnanensis, *Nomocharis pardanthina*, species of *Allium*, *Iris*, *Pedicularis*. On the opposite exposed side, within 100 yards, the same plants were in ripe fruit. They are all plants of the June aspect. These "delayed action" species must not be confused with the genuine autumn-flowering species, such as the beautiful blue *Gentiana gilvostriata*, which was in flower at over 12,000 feet in spite of the bad weather: I have seen it in full bloom so late as November, though it is a true alpine.

As regards the name on the map, Hkakabo Razi, the surveyors [1] coming from the south transcribed the name as they heard it pronounced locally either by the Darus or the Tibetans of the Adung valley. Nor is it surprising that they mistook *ka* for *hka*, the Chingpaw (but not the Daru) word for water; naturally their informants could not write. But clearly the name is the usual Tibetan name for any conspicuous snow mountain, *ka karpo* (lit. "snow white") and should be so spelt according to the orthodox transliteration of Tibetan names. *Razi*, which appears frequently in north Burma, far south of any permanent Tibetan settlement, is, I take it, the local Daru or Hkanung word for mountain or ridge, derived from the Tibetan word *ri*; just as *l'ka* is obviously derived from the Tibetan *la* (=a pass). The correct spelling of the name is thus Ka Karpo Razi (or Ri).

After leaving the Gamlang Wang I returned with all speed down the Adung valley, and on October 23 reached the rest hut at Gawai once more. The weather had been fine for a few days. On the 27th we started for the 10,000-foot ridge again, where we arrived on the 29th. On the 28th the fine weather broke up and now it rained by day and snowed by night. However on November 3 a longer fine spell set in and from the ridge I obtained commanding views over the country to north, south, south-east, and west. The atmosphere was bright as crystal, and mountains 50 or 60 miles distant stood out clearly. In every direction I saw long level ridges with cross-spurs sloping gently to conspicuous shoulders where they plunge abruptly down to the rivers. Except in the north and (as seen later from the Mungku Hkyet) east there are hardly any outstanding peaks.

The general level of these long parallel ridges, lying for the most part north and south, is 12,000–14,000 feet in the north and 10,000–12,000 feet in the south. The rivers are quite invisible, and the comparative insignificance of the river gorges, which loom so large when one is at the bottom of them, was now apparent. They seem no more than a fine engraving on the surface of a vast undulating plain, or rather plateau; and that in fact is what they are. For every main valley is dual, a valley within a valley. Looking to the westward and to north and south of west through nearly 180°, one is obviously looking across an ancient plateau which had formerly lain under an ice-sheet, or at least been furrowed by great glaciers, and has since been dissected by rivers. That is the explanation of these gentle slopes and rounded hills, the long level spurs and ridges, suddenly truncated above the valleys, the absence of sharp peaks. Even more significant are the wide trough-like upper valleys, obviously the work of glaciers. Sometimes the glacier valley itself is double, suggesting two phases in the retreat of the ice. It was now obvious why the

[1] These peaks were first observed in 1918 by a Survey of India party under Mr. M. C. Petters.

path on the first two days, from about 4000 feet (altitude of the Tamai) to about 9000 feet, had been so much steeper than on the third day. We had first to climb out of the river valley, up its precipitous flank to the lip of the ancient glacier valley. Once we were within the ice-trough the slope eased off.

This Irrawaddy plateau, with its Quaternary ice-sheet, covered 15,000 or 20,000 square miles, extending at least as far south as lat. 27° between the meridians 97° and 99°. Probably it extended considerably farther in a south-easterly direction, narrowing gradually; but the Mali valley (western Irrawaddy) shows no signs of glaciation, though this is not to say it was not a lower part of the plateau, which seems to have had a general slope to the south. But whether or no the ice extended as a continuous sheet over the highlands south of 27°, certain it is that the Salween–Irrawaddy divide was glaciated as far south as 26° (Htawgaw) and locally far down into Yunnan. There is abundant evidence of glaciation round Hpimaw, Imaw Bum, and the Chimili pass, on the Burma–Yunnan frontier, from 10,000 feet upwards. The surprising thing is that in this wet climate, with a dense cover of forest over the mountains, the Irrawaddy plateau should have retained so clearly the imprint of ice on its surface. It suggests that the glaciers were in existence down to very recent times.

To return to the view from the 10,000-foot ridge. I have already pointed out how insignificant the Adung and Tamai valleys appear from here; the eye could follow both of them for many miles from north to south-east. But the glacier valleys in which the river gorges are sunk are not so insignificant, being 10 or 12 miles wide from ridge to ridge. The depth to which the rivers have eroded their valleys varies. Hereabouts the Tamai has cut down 5000 or 6000 feet of rock, while the glacier valley above is only 1000–2000 feet deep. A plane following the Tamai river could fly up the glacier valley some 5000 feet above the river, *i.e.* about 9000 feet above sea-level.

Eastwards the view was hidden by higher ridges, but the snow-clad Salween–Irrawaddy divide was visible to the south-east interposing an apparently formidable barrier between Yunnan and Burma. Northwards the plateau-like appearance of the region is maintained for 30 or 40 miles until the view is cut short by the great cross range, actually a part of the Brahmaputra–Irrawaddy divide.

On November 4 I had a perfectly clear view of this cross range snow-covered for many miles, although the Ka Karpo peaks stood out conspicuously. Nevertheless even these rise only some 3000–4000 feet above the general level of the ancient plateau, which north of 28° had an average height of 14,000–15,000 feet. The extraordinary precipitousness and sharpness of these pinnacles, almost like steeples, holding very little snow except in winter, suggests that they pierced the ice mantle very much as nunataks do in Arctic lands. From my camp on the ridge I could follow the range, or more probably ranges, round an arc of about 100°, from a few degrees east of north to some degrees south of west, Ka Karpo Razi itself bearing 335° and another nameless snow peak in the cluster 326°. It may be permissible to suggest that westwards the cross range merges with and is in fact a continuation of the Dibang–Lohit watershed, and eastwards of the Salween–Irrawaddy (Taron) watershed. The Taron alone appears to have cut its gorge through it. The Ka

Karpo cluster is a high spot on a much greater range, no other part of which was visible; I was looking at it almost end on. At the sources of the Adung and Taron rivers the cross range is probably trending nearly north-west to south-east, so that I saw it obliquely. All the Tibetan rivers from the Yangtze to the Brahmaputra have had to pierce this range.

Three conspicuous gaps were visible dividing the mountains into four principal massifs. From east to west the gaps are: (i) the gorge of the Adung and the Namni pass, bearing 343°, which Lord Cranbrook and I had crossed in 1931. (ii) The gorge of the Tazon Wang, a right-bank tributary of the Adung just east of the Seinghku confluence with a wide saddle at its head, bearing 318°. I do not know whether this pass is used or not; it looks easy from the south, but the north side may be a high cliff. If it is a practicable pass it might afford a route to the west face of Ka Karpo Razi, though I very much doubt whether that would be an advantage from the climbing point of view. (iii) The Seinghku valley, forking at the head to two passes, the Diphuk La being the more northern, and both leading to the Lohit valley just south of Rima; bearing of fork, 302°.

The mountain blocks may be briefly described as follows: (i) The first visible peaks east of the Adung gorge are high and rocky. There may be snow peaks here, round the Namni pass; Cranbrook and I saw several glaciers in this direction, but the slopes are too steep to hold much snow, which avalanches into the valleys, forming deep snow beds. There is one conspicuous pyramidal peak, bearing 359°, just before the ridge drops abruptly to the Adung gorge. A little farther to the east of the Namni pass comes the Salween–Irrawaddy divide, which north of 28° is an almost continuous snow range. It was invisible from my camp. (ii) The next massif includes Ka Karpo Razi and its satellite peaks. A very spiky ridge—probably that at the head of the Gamlang Wang—appears to connect Ka Karpo itself with the next (twin) snow peak to the south-west, these being the only ones visible. The twin peak shows very abrupt snow slopes on each side. Then comes the Tazon gap. (iii) Between the Tazon gap and the Diphuk La stretches a more level mass of mountains with no outstanding peak. (iv) From the Diphuk La the range rapidly drops to the level of the plateau west of the Tamai.[1]

North Burma is not, or was not, the chaos of mountain ranges, spurs, and gorges it appears on first acquaintance. The discerning eye, looking down on the country from above, at once detects the ancient plateau; and immediately mountains and gorges fade into their correct perspective and become superficialities. To understand the significance of the Irrawaddy plateau, we must go back a little way in geological time to the Miocene period. At that time moist warm temperate forests covered the northern half at least of the Eurasian and American continents, and extended well within the Arctic Circle. Greenland then might have had a climate comparable with that of southern New Zealand now; it was densely forested. This Arctic summer

[1] I have given a rather detailed account of the snow range as seen from above Gawai because it is an altogether exceptional view. Future travellers wishing to reach Ka Karpo Razi would be well advised to climb to the ridge and see it for themselves. A closer view would be obtained from the ridge above what was once the Tibetan village of Tahawndam, in the Adung gorge; now abandoned. But that is much less accessible.

appears to have lasted throughout the Miocene period, and probably into the Pliocene. But the long summer was drawing to a close; the seas were cooling; the winters becoming sharper and longer. The stage was being set for the drama of the ice age. The northern ice sheet drove the flora of Europe southwards across the continent, where it was finally trapped between the ice on the one hand and the Alpine chain and Mediterranean on the other, and practically exterminated. More or less identical wedges of the northern Miocene flora were driven on the one hand into China, on the other into North America.[1] These floras travelled on southwards as long as there was any need to flee before the advancing cold, and survived. Long ago Asa Gray pointed out the relationship between the flora of the east Asiatic region and that of Atlantic North America.

This resemblance extends also to the eastern Himalaya. Drude showed that there was an appreciable east Asiatic (*i.e.* Sino-Japanese) element in the eastern Himalaya, but believed it to be isolated there. He regarded it as an outlier of the east Asiatic region. Yet it is not an alpine flora. It lies almost entirely between 6000 and 11,000 feet, and is by no means so isolated as Drude believed. In fact this survival of pre-glacial times can be clearly traced from the eastern Himalaya through north-eastern Assam and northern Burma to south-eastern China.

It has always been difficult to understand how, if the Himalayan glaciation was contemporaneous with that of the northern hemisphere generally, cold could have forced the Miocene Arctic flora into southern Europe, western China, North America, and the Himalaya, at the same time. But this difficulty disappears when we consider that the storm was brewing for tens of thousands of years before it burst. And throughout that long warning period the Miocene flora was slowly retreating towards the south and safety. That the Miocene flora reached mid-Europe safely, and had even dwelt there in comfort throughout the latter part of the long summer, is proved by the fact that seeds and fruits of many species still living in China and in North America have been discovered there and identified by Mrs. Clement Reid. Probably the Miocene flora covered the northern half of Asia and North America. With the approach of the glacial age it had to move south or perish.

It is improbable that the Miocene flora reached the Himalaya directly through central Asia or that a flora resembling it already inhabited the Himalaya. The Himalaya were growing colder and more inhospitable equally with northern Europe. Only the southern slopes would offer refuge to a flora seeking warmth. That part of the Miocene flora which moved south from central Siberia certainly perished just as the European flora perished. There may have been a time lag in the glaciation of the Himalaya owing to their lower latitude; but their great height and heavier snowfall would have largely compensated for this. The Miocene flora was a warm moist temperate flora which could not have crossed the high plateaux and mountain ranges of western China and Tibet. It was escaping from the cold. Thus we infer that it followed the coast-line of eastern Asia. It reached the Indo-Chinese peninsula and Malaysia; but it did not reach peninsular India. The torrid

[1] Sir Albert Seward, 'Plant life through the ages.'

swamps of the Gangetic plain were an obstacle as formidable as a great mountain range or a high plateau.

By middle or late Pliocene times the northern flora was probably well established in winter quarters in south-east Asia, along the southern edges of the Yunnan and Irrawaddy plateaux. The increasing cold to the north would make this region a sufficiently moist one, and its low latitude (23°–28°) would ensure a warm temperate climate. Many tropical and sub-tropical trees can stand a considerable fall of temperature—once they are established—so long as the atmosphere remains moist or the summer temperature is high. Thus they may extend many hundreds of miles beyond the tropic, and several thousand feet up in the mountains in a moist climate like that of north Burma or eastern Assam. This northern flora probably covered the whole of south-eastern Asia, or at least the mountainous parts, south of the Yangtze valley, spreading gradually north-westwards towards the eastern Himalaya, so that even Formosan species such as *Taiwania cryptomerioides* reached north Burma.

The recent work of the Chinese botanists in southern China is significant.[1] Their observations and collections confirm and emphasize the relationship between the east Himalayan and north Burma flora on the one hand and that of southern Yunnan and south-east China generally on the other, while Professor Hu also stresses the Indo-Malayan element in the flora of southern China. That the Irrawaddy plateau is really a westward extension of the Yunnan plateau is, I think, established by the general similarity of their fauna and flora. The Salween–Irrawaddy divide, which for 300 miles appears as a formidable barrier between Yunnan and Burma, can have had very little significance prior to the cutting of the river gorges; it may not even be of great importance to-day. The average altitude of the Yunnan plateau within a considerable radius to north, east, and west of central Yunnan is 12,000–14,000 feet, and that of the Irrawaddy plateau is not very different.

A collection of reptiles from the Tamai valley made by Lord Cranbrook and myself in 1931 indicates, according to Dr. Malcolm Smith, of the British Museum (Natural History), a much closer affinity with southern China than with the Indo-Malayan region. These reptiles must have spread over the country long before the Quaternary ice age.

But next to plants, it is the avifauna which brings out the relationship most clearly. This relationship between the north Burma and south-western Chinese birds has been pointed out by J. K. Stanford [2] recently, while the Tibetan traveller and naturalist F. Ludlow has drawn attention to the large Chinese element in the avifauna of the eastern Himalaya. That there should be considerable resemblance between the birds of north Burma below latitude 26° and central Yunnan is not surprising. But the resemblance appears to be almost as close in the north as it is in the south. This is clearly brought out in Lord Cranbrook's collection from the Adung valley, in spite of the lofty Salween–Irrawaddy divide. Out of 295 species noted by Stanford as common to north Burma and Yunnan, 45 have so far been obtained only

[1] Professor H. H. Hu, "Recent progress in botanical exploration in China," *Journal of the Royal Horticultural Society*, August 1938.

[2] J. K. Stanford, "On the birds of northern Burma," *Ibis*, January 1938 to April 1939; six parts.

north of 26° in Burma, and 90 both north and south of that latitude; the remaining 160 have been obtained only south of 26°. Some years ago I obtained a new species of trogon in the Seinghku valley (latitude 28° 10′). Later it was found by Delacour to be common in French Indo-China, several hundred miles to the south-east. It has since turned up again in north Burma, and will probably be found some day in the intervening region. Ludlow writes: "The avifauna of the Chayul valley gave much food for thought. All the five pheasants . . . differed from those of the Manas basin. We had entered a new area, where the influence of western Chinese forms of bird life was becoming very apparent." [1]

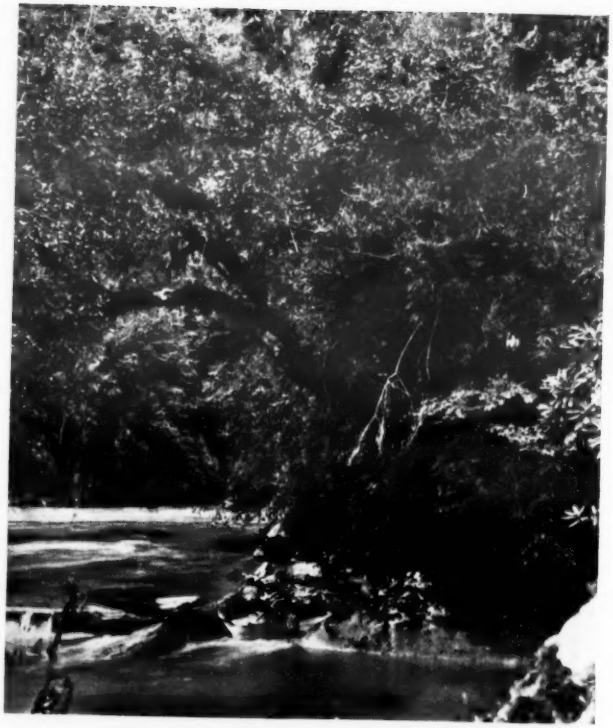
It may be objected that these are isolated examples and that particular examples of anomalous distribution can always be found. But the evidence for a strong biological affinity between south-eastern China and the eastern Himalaya, *via* north Burma, is steadily increasing. All this region, especially the eastern Himalaya and north Burma, is still very little known. When it is better explored there can be no doubt that many of the plants discovered lately by Chinese botanists in Yunnan will turn up there. At the opening of the Quaternary period, by which time the Miocene flora must have been firmly established in south-eastern Asia, it was no doubt also moving freely along the southern edge of the plateau. During warm periods it would move northwards along the mountains of Burma–Malaya up to north-eastern Assam, and north-westwards across Yunnan. During colder periods it would move towards the south and south-east.

Long before the dawn of the Quaternary however another quite distinct movement of the flora was taking place. During Pliocene time the flora of the north-west Himalaya was also on the run; it was moving south-eastwards along the Himalayan ranges, and southwards into peninsular India. It is a significant fact that of all the Himalayan species of rhododendron, only one, *R. arboreum*, reached peninsular India. Nevertheless the fact that one did is in itself illuminating. This *R. arboreum* must have reached the east coast of India from the west; and reached it long before the Quaternary ice age. It got as far as western Yunnan, where it reappears as *R. Delavayi*, a sub-species. Had it come from the south or south-east with the Miocene flora, the conclusion is irresistible that other species would also have reached peninsular India. Moreover we know that for the most part the Miocene flora did not reach the peninsula at all. Many widely spread genera, and even whole families, are entirely absent from this area. To mention a few, peninsular India has no *Betulaceae*, *Fagaceae*, *Hamamelidaceae*, *Saxifragaceae*, or *Coniferae* (except one species of *Podocarpus*); and no *Magnolia*, *Manglietia*, *Talauma*, *Illicium*, *Schizandra*, *Eriobotrya*, *Pyrus*, *Cornus*, *Agapetes*, or *Osmanthus*,[2] all of which are found in south China, and most of them in the eastern Himalaya, North (or South) America, and Malaya also.

During the Pliocene an alpine flora would have occupied the higher ranges of the Himalaya and the plateaux of Yunnan and north Burma, though what type of flora it was we have at present no means of knowing. But it was

[1] F. Ludlow, "The sources of the Subansiri and the Siyom," *Himalayan Journal*, 1938.

[2] Brandis, 'Indian trees.'



The upper Adung valley in spring

Snow peaks at the source of the Adung river

A Daru of the Adung valley with bamboo arrow case

Kachins pounding rice, hills east of Putao

probably related to the present Sino-Himalayan flora, which, though similar in habit to the alpine–arctic flora of northern Europe, is quite distinct from it floristically. In this connection I may draw attention to the remarkable dwarf *Cornus* which I found on the ranges above the Tamai valley at 8000–9000 feet altitude, *i.e.* below the critical altitude for alpine plants in north Burma. It is a creeping species hardly distinguishable from the north British and Arctic *C. suecica* and closely allied North American *C. canadensis*. It is one of the very few examples of a purely arctic species found in the Sino-Himalayan area, and may be a remnant of the old pre-glacial alpine flora (cf. *Pinguicula alpina*, *Oxyria digyna*). It almost certainly came from the north-west, not from the south or south-east. Just as, with the passing of the Miocene summer, the arctic flora which in Europe gradually replaced the warm temperate was pushed south by the advancing cold, and, with the return of warmth, retreated up the mountains; so it is probable that a similar course of events followed in the Himalaya. An alpine flora had previously established itself in the mountains. It was pushed south by the advancing ice-sheet, and part of it escaped through Burma and the Indo-Chinese mountains to Malaya. Thus *Primula prolifera* reached Java, while many Himalayan rhododendrons and trees such as *Bucklandia populnea* spread over the mountains of Malaya and the East Indian islands. These must have reached Malaysia before the final break-up of the archipelago, that is to say at latest about the end of the Pleistocene. But such trees as *Taiwania*, *Bucklandia*, and *Rhodoleia* probably reached north Burma much earlier. This flora kradually flowed back as the ice retreated until it reoccupied not only the southern exterior plateaux but covered higher and higher ranges of the Himalaya until it finally penetrated the interior plateau of Tibet. With it went traces of the now stabilized Indo-Malayan flora (*e.g. Gesneraceae*, *Bignoniaceae*, *Acanthaceae*).

Part of the eastern Himalayan flora must have been forced down to the Gangetic plain, where it perished, just as the Miocene flora perished in Europe. It was trapped. The effect of the cold would have been felt little beyond the foot of the Himalaya, and there was no high ground where it could take refuge until peninsular India was reached. The Gangetic plain too may have been largely mangrove swamp at this time. The European flora perished of cold; a considerable part of the eastern Himalayan flora perished of heat. Only that part of it which occupied the mountains to the east of the Bay of Bengal would have escaped. Farther east the way was open for the Chinese flora to move south and south-east out of range of the cold, but without being driven on to the hot plains.

The significance of the Irrawaddy plateau can now be appreciated. It is the link between the south-eastern Chinese and eastern Himalayan floras. Before the Quaternary glaciation an early alpine flora had evolved here. Gradually the plateau was covered by an ice-sheet from which glaciers flowed southwards. This temporarily disconnected the eastern Himalaya from the Chinese area, sterilized Tibet on the south-east side, and saved much of the mountain flora by pushing it south, where it was telescoped into the tropical Miocene flora. Throughout the ice age this tropical Miocene flora was pinned to the peninsula of south-eastern Asia; and to some extent the original alpine

flora forced south, passed through it, or even replaced it. But with the return of more genial conditions there has obviously been a considerable interlocking of the old Miocene, the Indo-Malayan, and the Sino-Himalayan floras along their meeting lines.

Glaciers grew up far to the south-east of the Irrawaddy plateau, on the plateau of Yunnan probably almost as far as Kunming (Yunnan-fu), and on the ranges which run southwards from the plateau almost to the Tropic of Cancer (*e.g.* near Shunning-fu). During interglacial periods the flora would move north and north-west again, with a good deal of intermingling as stated; only to be forced back once more. But after the final retreat of the ice from Europe some forty thousand years ago according to modern estimates, the general movement would have been northwards and north-westwards, as valleys were scooped out in the plateau, and the great gorges cut through the boundary ranges into the interior plateaux.

The course of events as they appear to a geographical botanist can be briefly summarized as follows:

I. *Miocene.* Moist warm temperate flora occupying the north temperate regions and extending beyond the Arctic Circle throughout the long Tertiary summer. Tropical Miocene flora in south-east Asia. Great lake systems, in Yunnan, north Burma (Hkamti Long, Hukawng valley?), and Assam (Manipur, Sadiya plain?).

Temperature gradually falling. Northern Miocene flora beginning to move south in all directions.

II. *Pliocene.* Northern Miocene flora moving southwards down the coast of China, reaches Indo-China and Malaya, where it mingles with the tropical flora. In North America it is moving south down the Pacific coast and south-east towards the Atlantic. In Asia, having reached south-east China, it moves north-west *via* the Yunnan and Irrawaddy plateaux to the eastern Himalaya; and from Malaya northwards into Burma.

At the same time flora of the north-west Himalaya moves south-east, *Rhododendron arboreum* reaching peninsular India and Yunnan.

III. *Pleistocene.* Beginning of glaciation in northern hemisphere and in the Himalaya. Miocene flora established in central Europe caught between ice-sheet and Alpine chain annihilated. Himalayan Miocene flora pushed south through Assam and Burma to Malaya; or on to Gangetic plain and annihilated. Many rhododendrons and *Primula prolifera* reach Malaya and Java.

In south China flora of Yunnan plateau pushed south and south-east into Indo-China. Alpine flora already established on Irrawaddy plateau escapes, as also does the Yunnan plateau alpine flora.

Tibet sterilized by the growing ice-sheet along its southern frontier, which also cuts off the eastern Himalayan region from western China.

IV. *Late Pleistocene.* Warmth returns, the glaciers retreat; more and more land is uncovered by the disappearing ice-sheet. The flora flows north.

V. *Recent.* Cutting of the river gorges through the outer plateaux, and presently through the main boundary ranges of Tibet, thus draining the lakes of half the plateau. South-eastern Tibet becomes moist owing to admittance of monsoon current through the gorges; is presently covered with

forests. Sino-Himalayan flora developed in alpine regions of the Himalaya, on the Irrawaddy plateau, in Yunnan, and western China generally, and throughout Tibet, by invasion and adaptation from southern and south-eastern sources. Many new genera closely related to existing genera (*e.g. Nomocharis, Notholirion, Cremanthodium, Wardaster, Berneuxia, Kingdonia, Salweenia*) evolved during the rapid march of the flora northwards.

Neither biology nor geography is an exact science, and the plant geographer with the knowledge at present available has often to guess. To him the species of the various world floras are like tiny pieces of coloured paper broadcast over continents, as in an immense diffuse paperchase; he must follow whither they lead as best he can. The difficulty of keeping to any particular scent is great; false trails lead in all directions. The above suggestions however—and no more is claimed for them—may serve as a pointer to future botanical explorers who will have far more evidence from botanical, zoological, geological, and other sources to guide them than is available to-day.

The dual structure of the valleys described above accounts for another curious feature which must strike every traveller in north Burma; the erratic courses of the main rivers. Examples are the Adung–Tamai valley, the Taron–'Nmai, and farther south on the Salween–Irrawaddy divide, the Ngawchang, an eastern tributary of the 'Nmai Hka. The Adung, after flowing south for about 50 miles, turns abruptly west, and flows in this direction for 10 miles to the Seinghku confluence, when it suddenly turns even more abruptly south-east. The south-flowing Taron makes a right-angled bend at the Tadzu confluence, and flows west for a short distance to the Tamai confluence, when it again turns south. The Ngawchang also makes two right-angled bends, but at the second, instead of resuming its original course to the south, it bends back on itself and flows north to the 'Nmai Hka.

If we ignore the river gorges for a moment and look only at the glacier troughs of the original plateau, the reason for this becomes clear. The small Seinghku valley and the Tamai form a continuous trough from north-west to south-east, and the first river valley was cut in this trough. The country to the east is considerably higher, and was still protected by an ice-sheet while the Seinghku–Tamai stream flowed—though of course at a much higher level than it does to-day. It was fed by small streams from the eastern glaciers. Gradually the ice-sheet melted, the glaciers dwindled, the streams from them grew bigger. Amongst the last glaciers to disappear were those occupying the Adung and Taron valleys. Eventually their streams became main rivers while the heads of the primitive main rivers—the Seinghku as compared with the Adung, the Tamai as compared with the Taron—took second place as tributaries. On this sectional system the present Irrawaddy headwaters evolved. The double right-angled bend of the Ngawchang can be explained in the same way, the mountains on either side of it being glaciated, as seen at the Chimili pass and Imaw Bum. The Ngawchang Hka cuts clean through the Imaw Bum spur between Hpimaw and Htawgaw, flowing in a deep gorge between peaks over 12,000 feet high 14 miles apart. Throughout its length as far south as 26° at least, the Salween–Irrawaddy divide is furrowed by glacier troughs, now occupied by rivers, parallel to the crest line. But at an earlier date, before the gorges were cut, there may also have been east–west

troughs, parallel to the main boundary range of the Tibet plateau. It is possible that the Adung and Taron valleys, where these lie east and west, are the remains of such longitudinal troughs, which are abundant in the Himalaya and in Tibet. Farther east the extraordinary course of the Wi Chu, a left-bank tributary of the Salween, of the Yangtze round the Likiang snow range, and of the Yalung can no doubt be similarly explained. All these rivers flow through heavily glaciated regions.

We reached the Tamai valley again on November 7, and after a week of clear weather another rainy spell began. Continuing our journey down the valley we turned off the main path on the 15th and on the 18th reached our old camp in the moss forest below the Mungku Hkyet. The weather cleared again. The view from the ridge here, because of the forest, is much more restricted than that from the 10,000-foot ridge, but to east and south it is open. We now had an uninterrupted view of the ranges eastwards towards the Taron gorge and the Salween–Irrawaddy divide. The contrast between the high sierra in this direction and the smooth plateau ranges we had looked over to the west and south-west is dramatic. The near range, which is the Tadzu–Dablu divide west of the Taron, is hacked into bare pinnacles and towers with knife-edge ridges and tremendous precipices too steep to hold snow. I had crossed this range by the Taru Tra pass coming from the Salween valley to the Tamai in 1922. It resembled the Ka Karpo ridge above the head of the Gamlang valley, although no peaks higher than 15,000 feet were visible. I infer that this part of the Salween–Irrawaddy divide between 28° and 27° is a direct extension of the Ka Karpo massif, and that the ridges which on the quarter-inch map appear to run north and south in echelon from west to east are in fact portions of the main boundary range of the Tibet plateau, cut through by successive headwater streams of the Irrawaddy. The range is here striking south-east towards the Likiang peaks. In about latitude 28° the Salween is flowing in a tremendous gorge, and it also is cutting across the range.

South and south-west of this boundary range lies the outer plateau of Yunnan, the north-west corner of which I have called the Irrawaddy plateau. To north and north-east of the boundary range also western China is a dissected plateau.

I spent five days at the Mungku Ḥkyet, where I had found many north Burma endemics such as *Berberis hypokerina*, *Rhododendron Martinianum*, *Gentiana grata*, *Pyrus Harroviana*, species of *Vaccinium* and *Pentapterygium*, and a curious plant (*Patrinia* sp.) belonging to the family *Valerianaceae*, besides new species. I also found here the Himalayan *Rhododendron fulgens*, a long way east of its known distribution. The flora is indeed strikingly different from that at equivalent altitudes on Ka Karpo Razi, where a Sino-Himalayan flora occurs.

Descending once more to the Tamai river, I reached the bridge at Pangnamdim on November 26 and Fort Hertz on December 12. The fine weather had now set in, and after spending a week with Major Stubbs while packing my collections, I set out for Myitkyina, where I arrived on 2 January 1938. I had been just over six months in north Burma.

ON SOME MISREPRESENTATIONS OF ANTARCTIC HISTORY

THE DISCOVERIES OF ANTARCTICA WITHIN THE AMERICAN sector as revealed by maps and documents. By WILLIAM HERBERT HOBBS, University of Michigan. Supported by grants from the American Philosophical Society and the University of Michigan. Transactions of the American Philosophical Society held at Philadelphia for promoting useful knowledge. New Series—Volume XXXI, Part I, January 1939.

THIS memoir, which has been widely distributed by the author, attempts to prove that the Antarctic Continent was first discovered by the American sealer, Captain Nathaniel Palmer, of Stonington, in November 1820, and that it is wrong to believe, as has been customary, that Edward Bransfield had already discovered it in the early months of that year. The argument is maintained in hostile terms—forgery, hoax, fake, purloined, suppressed, fictitious.

We will examine these revealing Maps and Documents. But before dealing critically with them and with Professor Hobbs' treatment of them it will be convenient for us to set out what we believe to be the natural, and usual, interpretation of what evidence there is, always remembering that it is scanty; that of all the activity in the South Shetlands in the years following their discovery, very much was never put on record.

The South Shetlands were discovered by William Smith, master of the brig *Williams* of Blyth, in February 1819, and revisited in October of that year, when Smith landed and claimed the territory for the British Crown. On his arrival at Valparaiso he and his ship were taken over by the British naval authorities and sent back with Edward Bransfield and a small naval staff in December 1819 to survey the new territory. During their absence on this duty an account by Miers of the discovery (Document I), and a sketch-map by Foster (Map A), both dated January 1820, were sent home and published in the *Edinburgh Philosophical Journal* (Map B).

Bransfield landed in George's Bay on the south coast of the eastern island on 22 January 1820, planted the British flag, and again took possession for the Crown. On January 30 he discovered land in 64° south latitude which he named Trinity Land; he sketched the coast eastwards and plotted the high mountain which now bears his name; discovered Clarence and Elephant Islands, and as the season was then late returned to Valparaiso. Bransfield's charts (Maps C and E) are in the collection of original documents of the Hydrographic Office at Cornwall House. A brief account of this voyage (Document II) was communicated to the *Edinburgh Philosophical Journal* by the naval assistant surgeon (Young) who was sent with the expedition. A much fuller account (Document III), communicated by permission by another of the officers, was published in the *Literary Gazette* of London.

Smith returned in the *Williams* to the South Shetlands for the season of 1820–21, and his great success in sealing is recorded by Bellingshausen on the authority of Palmer (Document VI). Smith then came back to England and

at the end of 1821 addressed a Memorial to the Lords Commissioners of the Admiralty, with a chart to show his discoveries, which was sent to the Hydrographer, received by him through Admiralty Records on 3 January 1822, and is in the collection of original documents at Cornwall House (Map F).

Nathaniel Palmer commanded the small sloop *Hero* which acted as tender to the Stonington sealing fleet of 1820–21. The only account of their operations is found in Fanning (Document VII, 1833), who describes, without any dates, how land to the south had been seen from the look-out on Deception Island, and Palmer was sent south to examine it. He found the land in much the same place as Bransfield's Trinity Land, about 64° south 60° west, on a day until lately given as 14 January 1821, but now as 18 November 1820 by Colonel Lawrence Martin on the authority of the log of the *Hero*, as yet unpublished (Document V).

Palmer was sent on a second voyage to this land a year later, and thence to Elephant Island, where he joined Powell, and went with him to the discovery of the South Orkneys. There is no evidence that Palmer himself ever made any maps or wrote any account of what he had seen.

Bellingshausen had received news of Smith's discovery through the Russian Minister in Rio de Janeiro (Document VI), and proceeded to the South Shetlands in January 1821. While making a running survey of their southern coasts he encountered Palmer in the *Hero* on 6 February 1821, invited him to his ship, and had a brief conversation with him on the work of the British and American sealers among the islands. According to Fanning, writing in 1833 (Document VII), Palmer told Bellingshausen of his discovery of new land to the south, and the Russian admiral said that it should be named Palmer's Land. The story of this meeting has been elaborated in the course of years (Document VIII), but there is not even a mention of it in Palmer's log, and Bellingshausen says nothing of Palmer's Land.

The British sealing captain Powell compiled a map of the South Shetlands (Map H) from his own observations on the northern side of the group, during the seasons 1820–21 and 1821–22, combined with the information of fellow captains for the south. On this map he showed his friend Palmer's Land. Powell's map was published by Laurie in 1822, with a pamphlet of Notes (Document X) which show that he was a keen observer and surveyor. These Notes are the principal authority for the details of his discovery of the South Orkneys in company with Palmer in December 1821.

James Weddell was the first British sealing captain to proceed direct from London to the South Shetlands. He was at work there for the three seasons 1820–21, 1821–22, and 1822–23. His book (Document XI) published in 1825 contains only slight references to the work of the first two seasons, but gives charts (Maps K, L, M) of the South Shetlands and South Orkneys based on those earlier years, and of his voyage to 74° south into what is now called the Weddell Sea in February 1823.

In the space available for a review it is impossible to cover the ground in the detail required to do justice to the whole Memoir: but the early years are the most interesting and important, and it will appear that careful consideration of them will be sufficient.

Professor Hobbs begins by attributing to Bransfield first a share in and later the full authorship of the indifferent map (Maps A and B) which Foster drew in January 1820 at Valparaiso to illustrate the discoveries of William Smith in 1819. It is so clear that Bransfield had nothing to do with this map that the attempts to father it upon him and the pretence that it represents his voyage in the *Williams* of January and February 1820 must be called deliberate misrepresentation.

Professor Hobbs then turns to the original manuscript map signed by Bransfield (Map C) and the map engraved from it (Map D) and published by the Admiralty in November 1822: of the former he doubts the authenticity and the latter he roundly calls a fake. Of the two published accounts of Bransfield's voyage he calls the unsigned notice in the *Edinburgh Philosophical Journal* (Document II) the official report, which it is not; and the much better account in the *Literary Gazette* (Document III) he dismisses as anonymous and belated, having three times dated it 1822 instead of 1821. The manuscript map drawn by W. H. Goddard and submitted by Smith to the Admiralty not later than December 1821 Professor Hobbs denounces as a palpable forgery, having himself falsified the photograph of it he obtained from the Admiralty by cutting out a small piece, about one-twelfth, so as to evade the title, the author's name, and the date, and sticking on pieces of the original divided border with the longitude shifted 5 degrees.

This is the crux of the matter. The positive evidence that Bransfield discovered the Antarctic Continent is: first the chart with his signature which is in the Hydrographic Office (Map C); secondly the account of the voyage in the *Literary Gazette* (Document III); and thirdly the confirmation in Smith's map drawn by Goddard (Map F). Professor Hobbs refuses to accept any of these as genuine, and we for our part refuse to accept his judgement of them, for reasons which we shall set out in detail. There is nothing in the whole of his arguments which shakes the authority of these three documents; we therefore maintain that Bransfield with Smith in the brig *Williams* discovered the Antarctic Continent on 30 January 1820.

We now come to Palmer and his sloop the *Hero*, whose log is in the Library of Congress (Document V), the one surviving original document that might be expected to give some account of Palmer's discoveries. Professor Hobbs does not say that he has ever examined it, and derives no part of his case from it, except by quotation from Palmer's biographer Spears (1922) for certain facts, and from Colonel Lawrence Martin's statements concerning it, which go no way to explaining the direct conflict between himself and Spears (Document IX) on the content of the log for the critical days 15–24 November 1820: Spears giving a circumstantial account of a voyage from Deception Island to the north round Livingston Island during those days, and Martin relying on it to prove the discovery of the Antarctic Continent on November 18. Since no one has ever published any transcript of a single sentence from that log for the critical days in November, and inquirers are at present refused photostats of it, the conflict of evidence cannot be resolved. Colonel Martin says explicitly that Palmer made no maps. Spears says explicitly that no member of the *Hero's* company ever wrote any narrative of her voyage, that

Palmer was not a surveyor, and was interested only in the commercial side of his undertakings. But Professor Hobbs, relying on a newspaper account of a paper given to the Stonington Saturday Club by Palmer's niece in 1907 (Document VIII), said to be based upon a journal which has since disappeared, alleges that Palmer produced a chart of his discoveries to Bellingshausen, and that this chart he handed to Powell at Deception Island about December 1821 or January 1822, though Powell says he was never south of the South Shetlands, and therefore never at Deception Island (Document X).

Professor Hobbs claims, then, that Powell's compilation (Map H) is really Palmer's map, and calls it always the Palmer-Powell map; charges the British Admiralty with suppressing it and the accompanying notes, though the map was frequently republished; and charges Weddell with copying it for his book (Document XI, Map L), though the two are very different. He also denies the facts of Weddell's voyage to the south in 1823 and labels him elsewhere a Fake Explorer, in spite of what Fanning says of him: "that persevering navigator Weddel, who has sailed farther south than any other navigator has been known to do."

Professor Hobbs takes credit to himself for having gone to the original documents. We have briefly indicated how he treats them, and must now consider them in detail.

DOCUMENT I. *Account of the Discovery of New South Shetland, with observations on its importance in a Geographical, Commercial, and Political point of view: with two Plates.* By Mr. J. Miers. Communicated by Mr. Hodgskin. *Edinburgh Philosophical Journal.* Art. XXI, pp. 367–380, dated Valparaiso, January 1820. Volume III, No. 6. October 1820.

Professor Hobbs reprints "all the essential parts" of this narrative and reproduces the map from Plate XII as his Fig. 1 (see Map B). He has a sub-heading *Smith's landing on St. George's Island*, for King George's; finds fault with Miers' account of the geology, though it was admittedly "from the description I could obtain from the mate" who had been sent ashore to plant the Union Jack; says that the landing was at "North-east Foreiand" for North Foreland; and remarks on Smith "having mistaken a group of islands for a mainland."

Mr. Miers begins his paper thus: "During my last visit to Santiago, to convey A. and Lady C. to Valparaiso, I employed my first leisure hours in drawing up the following paper. I shall introduce the detail in regular order, previously hinting my opinion that a large Southern Continent is about to be discovered." When Captain Shirreff of the *Andromache* chartered the brig *Williams* to send Bransfield on his voyage of further discovery "so prompt were his measures, that although the vessel was loading to convey my goods to Concan Bay, the moment of his arrival in the port the bargain was concluded. Every article of mine was again transhipped." So Mr. Miers was a merchant, who while the brig was discharging and refitting obtained from Smith and his mate the material for his paper. The *Williams* had returned from the South Shetlands only in November (Miers), or "about the beginning of December" (Young, Document II, p. 345), and sailed again on December 19. Henry Foster's drawing (Map A) and Miers' paper are both dated January 1820 and cannot have been seen in their final form by Smith. So to Miers, with his avowed predisposition, rather than to Smith, may be attributed any tendency to represent the newly discovered land as a mainland "about to be discovered."

MAP A. A drawing in line and wash entitled *A View of the Land Discovered by William Smith Master of the Brig Williams of Blyth Feby. 1819 and taken possession of in the name and on behalf of His Britannic Majesty George III and called New or South Shetland.* Henry Foster, Mid[n] H.M.S. *Creole* Jany. 1820. Press Mark Ae1 S90/3 in the Original Documents of the Hydrographic Office, Cornwall House. Size 13·9 by 10·7 inches inside the border, with a map 6·0 by 5·1 inches in the top right-hand quarter, panoramic wash drawings of the coast, and a list of names or brief descriptions lettered, with corresponding letters on the drawings and on the map.

Professor Hobbs reproduces the map on his Plate I (top), ignores the title, signature, and date January 1820, and labels it "Map of the South Shetland Islands by Smith and Bransfield, 1819 and 1820."

Bransfield had sailed from Valparaiso in the *Williams* on 20 December 1819 and did not return until 14 April 1820 from this first visit to the South Shetlands, so he can have had no hand in the map. It was doubtless from information supplied by Smith, but he had gone south again in the *Williams* and was away in January 1820 when the map was drawn. The general exaggeration of the land southwards, and use of the word "mainland" are not necessarily Smith's, but more probably reflect the ideas of Miers, who in the same month was writing for the *Edinburgh Philosophical Journal*, Document I, with Map B as illustration: we might well call it the Foster-Miers map.

MAP B. *Chart of the newly discovered Land | New South Shetland | with the Tract of the Merchant-Brig Williams | Wm Smith Master | who in three passages between the Rio de la Plata and Valparaiso ascertained its existence.* Engraved as Plate XII of the *Edinburgh Philosophical Journal*, vol. III, No. 6, October 1820, to illustrate an account by Mr. J. Miers, pp. 367–80. The engraved map evidently from the same source as Map A, but not identical. The lettered list transferred to the face of the map from among the drawings, which are engraved as Plate XIII.

Professor Hobbs reproduces this engraving as Fig. 1, p. 10, with the title "Smith-Bransfield Map of the South Shetlands, 1820"; reproduces it again in the lower half of his Plate II with the same ascription; calls it Bransfield's Map on p. 15; and uses it to "show that Bransfield's land is really the South Shetland Islands group and not the Antarctic continent." On p. 43 he calls it "the original Bransfield map of Dr. Adam Young" and finds in it "a remote resemblance" to Weddell's map of the South Shetland Islands and Trinity Land, by drawing in his Fig. 3 the former on a scale more than twice as big as the latter.

The date January 1820 on Henry Foster's Map A, from the same source as Map B, shows that Bransfield cannot have been the author or part-author of this map. Mr. Young, in his brief account of Bransfield's voyage, Document II, has no map, but refers in a note to Map B published with Miers' paper. The phrase of seven words we have quoted contains then two misrepresentations.

DOCUMENT II. *Notice of the Voyage of Edward Bransfield, Master of His Majesty's Ship Andromache, to New South Shetland. Edinburgh Philosophical Journal.* Art. XVII, pp. 345–8, dated H.M.S. *Slaney*, Valparaiso, 26 May 1820. Vol. IV, No. 8. April 1821.

Professor Hobbs calls this notice "The report of this cruise . . . by the surgeon of the expedition, Dr. Adam Young," and quotes "with some fullness,"

actually in full, on pp. 14 and 15. "This report confirms that of Smith and made use of his map for illustration": actually only by reference to Miers (Map B) for their first landfall. The "Maps copied from Bransfield's Map of 1820" and the reproductions on Plate III, "Maps copied from Smith-Bransfield Map by atlas makers of Europe and America," are all from Miers (Map B), and have nothing to do with this Notice.

The writer of the Notice does not give his name, but says only: "as it was deemed necessary to send a medical officer, I went as a volunteer on the occasion." Miers (p. 374) gives his name as "Mr. Young, assistant-surgeon of the Slaney sloop of war." His account is brief and obscure, after they left the "extensive bay" where they landed: evidently George's Bay. "In short, we traced the land nine or ten degrees east and west, and about three degrees north and south . . . we could not ascertain whether it formed part of a continent, or was only a group of islands. If it is insular, there must be *some* of immense extent, as we found a gulf nearly 150 miles in depth, out of which we had some difficulty in finding our way back again." The limits embrace all the land shown on Bransfield's chart, from Smith Island to Clarence Island, and from the Seal Rocks north of Elephant Island to Bransfield's Trinity Land (see Hobbs, Plate XIV).

DOCUMENT III. *New Shetland.* The *Literary Gazette and Journal of the Belles Lettres* (London), vol. V, pp. 691–2, November 3; 712–3, November 10; and 746–7, November 24, 1821. [The better account of Bransfield's voyage.]

Professor Hobbs gives the correct date 1821 in footnote 102, p. 36, but in the text persistently makes it 1822: thus on p. 36 the first issue of 3 November 1821 is made two days later than the date of the Powell map, 1 November 1822; on p. 37 he makes the third issue of 24 November 1821 "almost a month" later than the Powell map and four days before the issue of the Bransfield chart by the Admiralty on 30 November 1822; lastly, on p. 43 he refers to "the *Literary Gazette* article of 1822." He finds "very strong reasons for doubting the genuineness" of the article which he had misdated several times: "entire lack of any correspondence between the anonymous *Gazette* report and surgeon Young's report, which up to this time had been accepted as correct" though equally anonymous. The first instalment indeed "corresponds to the report of Dr. Adam Young on which all geographers had based their maps," a repetition of the error discussed under Document II; but "To assume that the surgeon who accompanied the expedition, and offered a report upon it which was accepted [by the *Edinburgh Philosophical Journal*], did not know that the expedition had discovered the far eastern group of islands, or a new continent to the south, if indeed they had been discovered, passes the bounds of credibility." Professor Hobbs quotes only a few lines from the introduction to III, but includes the statement "we have procured for our Paper an authentic copy of the Journal kept on board the brig *Williams* during her second voyage to New Shetland, when employed by authority . . .," and gives a very brief account of the important contents.

The introduction to this Document III recalls that the *Gazette* had furnished the first notice of this discovery "of the *new land*, of which maps and charts are now selling in all the principal shops in London." The first part gives some account of the coast from The Start eastwards to Desolation and round to George's Bay, where Bransfield landed and took possession by the name of New South Britain, though Smith, according to Miers, had abandoned that name for

New South Shetland; "he likewise buried a bottle, containing several coins of the realm, given by different people for that purpose." The second part gives a long account of the operations in George's Bay, surveying, watering the ship, and visiting Penguin Island. The third part is the most important. Having sailed on January 27, west-south-west, with glimpses of the southern shores of the South Shetlands through fog, they were at noon on January 30 in 63° 16′ S. 60° 28′ W., and in consequence of the weather steered southwards. "At three o'clock in the afternoon . . . the haze clearing, they very unexpectedly saw land to the S.W.; and at four o'clock were encompassed by islands, spreading from N.E. to E. The whole of these formed a prospect the most gloomy that can be imagined, and the only cheer the sight afforded was in the idea that this might be the long-sought Southern Continent, as land was undoubtedly seen in latitude 64°, and trending to the eastward. In this bay or gulph there was a multitude of whales, and a quantity of sea-weed, apparently fresh from the rocks. A round island was called Tower Island, latitude 63° 29′, longitude 60° 34′ and the land Trinity Land, in compliment to the Trinity Board."

From this, sailing north-east in stormy weather, "Land and islands were observed to latitude 61° 30′ and longitude 56° 54′ "; on February 2 they landed at Cape Bowles and took possession of Clarence Island; on the 13th Smith landed on the Seal Islands north of Elephant Island. For much interesting detail we must refer to the original, of which a photostat is in the Library, R.G.S.

This Document III is based upon the Journal of the brig *Williams*, which would have reached home during the summer. It must be taken as of authority at least equal to Document II, and is perfectly consistent with Maps C, D, E, F.

MAP C. Manuscript chart with no title. Press mark Ae1 S92 in the Original Documents of the Hydrographic Office at Cornwall House. Signed E. Bransfield. Represents the South Shetlands, Trinity Land with the note "partly covered with snow," Hope Island and stretch of coast south of it with note "here the coast was lined with icebergs" and "high mountain covered with snow," Clarence Island, north coast of large unnamed island (Elephant Id.), and Seal Island north of it.

MAP D. A Chart of | New or South Shetland | seen in 1819 | by Wm. Smith Master of the Brig Williams | Surveyed by | E. Bransfield, Master R.N. in | 1820. Published according to Act of Parliament by Capt. Hurd, R.N., Hydrographer to the Admiralty, 30th November 1822. Many profiles of north coast South Shetland and Clarence Island and one of Hope Island (Hobbs, Plate XIV).

MAP E. Manuscript plan. George's Bay. Press mark Ae1 S90 in the Original Documents at Cornwall House. Signed E. Bransfield.

Professor Hobbs saw at Cornwall House both the engraved chart D and "what purports to be the manuscript map [Map C] from which it had been made" (p. 37), but found very strong reasons for doubting its genuineness: "*The ship's track is not given* . . . if the signature is genuine, the entries upon the map are in a different script-hand . . . the entire lack of any correspondence between . . . surgeon Young's report, which up to this time had been accepted as correct," and the *Gazette* report (Document III), with which the map is in "general harmony."

Professor Hobbs calls the engraved chart "Unpublished Admiralty Map of 1822" on p. 36, a "chart without number" on p. 37, and on p. 38 "this Admiralty map of 1822, *never distributed*," "this faked map," "the grotesquely inaccurate

map"; says "The first *published* map of 'Trinity Land' is dated 1825," and "The desire to take credit from Palmer is all too clearly seen as the motive in supplying this map."

The motive might, on the other hand, have been the desire to give proper credit to Bransfield, though how either could be served by supplying a map and never distributing it is not clear. The signatures on both manuscripts C and E are the same, in the elaborate style of the period. The signature on Map C and most of the names are written with south at the top, often convenient even on engraved maps of the Antarctic, and if some are the other way, that is more natural in a working original than in a copy or an effort of imagination. Admiralty charts were not numbered until seventeen years after the date of this. The engraved chart is rare, but there is at least one copy in private ownership, so it was published. A finished chart does not necessarily show the ship's track: it may be so complex that it would spoil the chart.

MAP F. Manuscript. *A Chart of New South Britain discovered by Captain Smith in the Brig Williams the 19th of February* 1819; under the title is written in a different hand: "Drawn by William Henry Goddard." Press mark AE1 S91 in the Original Documents of the Hydrographic Office, Cornwall House. The main chart measures 23·2 by 19·5 inches and covers latitudes 50° to 70° S., longitudes 35° to 85° W. On the right are two insets, the first 12 by 7 inches, a plan of George's Bay on the scale of 2 leagues to 72 millimetres, the second 7·5 by 7 inches, a plan of the coast Start Point to Shirreff's Cape. Endorsed on the back in a contemporary hand: "Received from the Record Office 3rd January 1822," with the stamp of the Hydrographic Office. Endorsement rewritten on the face of the chart in a modern hand, probably when the original was mounted on canvas, later than 1913. In the lower margin is a good water-colour sketch of the brig *Williams* approaching the northern coast of the South Shetlands. The chart is reproduced in a small half-tone block in this *Journal* for October 1913, p. 365, to illustrate an article by Ida Lee (Mrs. Charles Bruce Marriott), with separate reproduction of the water-colour drawing.

Professor Hobbs reproduces a small portion, less than one-twelfth, of this original manuscript in the lower half of his Plate I with fragments of the divided border annexed, but with the lower shifted 5° so that meridian 60° is numbered 65°. He gives to this fragment thus manipulated the title "Map found at the British Admiralty which was in 1913 described as a map made by Smith on his first voyage to the South Shetlands in 1819. Obviously a forgery. (Photographed from the original chart in the Hydrographic Office, London)"; calls it on p. 11 a "map quite obviously manufactured published by the Royal Geographical Society" and "this faked map"; and on p. 12 he says: "This faked map is obviously sketchily copied from the Palmer-Powell map of 1822." He ignores the dated endorsement which clearly refutes that charge.

Mrs. Marriott described the water-colour drawing as of the brig *Williams* nearing the South Shetlands in February 1819, but did not describe the map as made by Smith in his first voyage; on the contrary, she labelled it "drawn by William Henry Goddard." She gave a full account of how the brig was chartered by Captain Shirreff and sent back to the South Shetlands with Bransfield, but did not make it clear that the map showed the results of that voyage. She assumed, probably rightly, that Goddard was an officer of the brig; and that Smith's landing in October 1819 was in George's Bay, which may be right also; there are indications to that effect, but the narrative of Miers is not clear.

The history of this map was unknown when Mrs. Marriott wrote in 1913, and has only recently been cleared up. Lieut.-Commander Gould has found in the Public Record Office a "Memorial from William Smith, discoverer of the South Shetland Islands, to the Lords Commissioners of the Admiralty" (P.R.O. Admiralty | Secretary, Letters 5029. Pros. 498, 1821). An endorsement dated December 29 is in the writing of J. W. Croker, Secretary to the Admiralty, and the document is stamped 31 December 1821. A note in red ink says "the chart herein referred to has been sent to the Hydrographer" and the chart is endorsed, as above "Received from the Record Office 3rd January 1822."

The authenticity of this chart is thus fully established, and its relations to Bransfield's charts explained: Smith and Bransfield were there together, and Smith no doubt did some of the work. The inset plan of George's Bay has nearly the same soundings as those inserted on Bransfield's MS. in pencil. The representations of Trinity Land (unnamed) and of the northern coast of Elephant Island (unnamed) and of Clarence Island are nearly the same as Bransfield's. But the representation of the South Shetlands is much better than Bransfield's, because Smith had spent the season of 1820–21 sealing there, as related in the Memorial, and as we know also from Bellingshausen's account of his conversation with Palmer. The line of soundings south of the group, the name Edwards Island for Deception, the convex northern coast-line, are among the details special to this map which would have refuted the charge it was copied from Powell if the endorsed date had not made that impossible. The ship's track is the single track of the discovery, to illustrate the Memorial.

DOCUMENT IV. Registry of Palmer's sloop *Hero* in the Customs House at New London, Connecticut. Facsimile Hobbs, Plate IV.

Professor Hobbs says on p. 16 that Palmer's sloop *Hero* was built at Groton for the special purpose of exploration, and implies that she was built for the Stonington expedition under Pendleton in 1820. But the facsimile of her registry (Hobbs, Plate IV) says plainly that "the said Ship or Vessel was built at Groton in the State of Connecticut in the year eighteen hundred," and that she was registered to her new owners on 25 July 1820.

Professor Hobbs says on p. 17 that the "*Hero* was registered on June 25th (Fig. 2) and according to Captain 'Alec' Palmer, Capt. Nat's brother, the *Hero* sailed on June 31st . . ." But Fig. 2 on p. 17 is a "Facsimile of summary of registers of the Stonington sealing fleet of 1820–21," which says that the register was granted on 25 July 1820, and that former registry was on 20 February 1816 at New London. Professor Hobbs has since corrected June 31 to July 31 and deleted the attribution to Alec Palmer.

The *Hero* was therefore just a sloop twenty years old, not a special survey vessel built for the use of Palmer, and the dates of building, registry, and sailing are all wrongly stated in the text, as is proved by Hobbs' Fig. 2 and Plate IV.

DOCUMENT V. *Log of the sloop Hero.* Library of Congress.

Professor Hobbs says (p. 17) that it was Captain Palmer's custom in ship's logs to deal only with the vessel's movements, the weather, and his success in finding seals, and thus, on p. 21, explains why the *Hero's* log says nothing of the conversation with Bellingshausen on the discovery of a continent.

Colonel Lawrence Martin, Chief, Division of Maps, Library of Congress, contributed to Section IV, Géographie Historique, of the Congrès International

de Géographie, Amsterdam, 1938, a short paper entitled "An American discovered Antarctica," printed in the *Comptes Rendus* published before the Congress. He there states that the logbook demonstrates that Palmer discovered the mainland of the seventh continent at 4 a.m. on Saturday, 18 November 1820, near 60° 10′ of west longitude and 63° 45′ south latitude, and that Palmer was the first person to visit, to see, and to accurately ascertain the latitude of the Orleans Channel and the adjacent coast which we now know to be the Antarctic mainland. He dismisses the claim for Bransfield's priority as third-hand, not based upon any existing logbook, and ignores the manuscript chart with Bransfield's signature, our Map C. He makes the valuable observation that the log of the *Hero* and other contemporary documents in the Library of Congress show that Palmer determined geographical positions creditably "but not plotting his observations into maps." And of an American author, writing from Philadelphia, who said that only remarks about the weather and the sea are entered in the log: "this gentleman did not read the right portion of the logbook."

In the Selected Bibliography appended to his paper for Amsterdam, Colonel Martin includes "Martin, Lawrence: The log of Palmer's Discovery of Antarctica, Proceedings of the American Philosophical Society, 1938 (in press)." When it had not appeared by March 1939 we made inquiry and were informed that the manuscript had not yet been delivered. And when we asked of the Library of Congress that we should be allowed to purchase photostats of the *Hero's* log covering the days 15–24 November 1820, we were told that they could not be supplied until after the paper was published.

This is the more regrettable since what purports to be derived from its authority is singularly contradictory. Spears, who published his life of Palmer in 1922 (Document IX), and had access to the log and all other surviving material, says that Pendleton sent Palmer to search for new seal rookeries; that Palmer sailed from President Harbour at 2 p.m. on 15 November 1820 and stood over for Deception Island; that he left there on November 16, cruised to the north round Livingston Island and found several beaches; returned to the fleet at President Harbour, and went with the fleet to Yankee Harbour in Deception Island on November 24. This is what Colonel Martin calls an "erroneous digest" of a log which properly read records the discovery of the Antarctic Continent during precisely those same days 15–24 November 1820. It stimulated a desire to read for ourselves: hence our regret that the Library of Congress declined to supply photostats.

Professor Hobbs said on p. 17 that the Stonington fleet, with the *Hero*, arrived at the South Shetland Islands on November 25: on the authority of Alec Palmer quoted by Balch. This date being inconsistent with the discovery of Antarctica on November 18, he has in a correction slip substituted November 12 for 25, with Spears as his authority. But he has again failed to observe that even this allows only three or four days for Palmer's discovery of Deception Island in the *Hero* (p. 17), the establishment of the look-out on the mountain there, Pendleton's arrival with the fleet and first sight of the southern land as narrated by Fanning (p. 435) and by Hobbs (p. 18), and the despatch of Palmer to the south from President Harbour at 2 p.m. on November 15 (Spears). To explain this also we must await publication of the log.

MAP G. *The World.* Entered according to Act of Congress, the 28th day of September 1821 by William C. Woodbridge, of the State of Connecticut. Hobbs, Frontispiece; the smaller edition, Plate VIII.

Professor Hobbs describes this map as in hemispheres of 8½ inches diameter, first issued loose, and later in Woodbridge's Modern Atlas of 1823. The same map, somewhat smaller, was published in Woodbridge's School Atlas of 1821. It shows the South Shetlands and Palmer's Land, but the whole group in the larger map, including Clarence Island, is less than 7 millimetres long.

We may agree with Professor Hobbs that for so small a scale the representation is accurate. A small arc of land cutting the 60th meridian in about 64° S. is named Palmer's Land, and this seems to be the earliest surviving published map to show the Antarctic Continent. Palmer was there on 18 November 1820; between November 27 and January 12 he was transporting skins (p. 17). According to Spears, citing the log of Captain Pendleton, on 14 January 1821 Palmer sailed eastward to look for more islands, and on January 28 returned, having found none. Bransfield was at Clarence Island on 4 February 1820 and round about this and Elephant Island until February 13 or later. There is no mention of Palmer being there until late in 1821, nor any other account of these islands. If then the plates of Woodbridge reproduced by Professor Hobbs are in the original state and not with later additions though retaining the original date, whence did Woodbridge learn of them if not from some word of Bransfield's work, or of Weddell's?

DOCUMENT VI. Bellingshausen's Two Voyages of Exploration in the Antarctic Ocean . . . (in Russian). St. Petersburg, 1831. Two volumes and Atlas. Translation of the part covering 18–25 January 1821 (Old Style), communicated by Professor Frank Debenham from an unpublished translation made for the Scott Polar Research Institute, Cambridge, with tracing from the chart in the Atlas.

In the following summary we have followed Professor Debenham in changing the Russian place-names into those of the modern chart, but retaining the dates of the Julian Calendar as used by Bellingshausen. It would appear that in his book he uses civil date, not ship's date, for the hours before noon, and that his January 25, 10 a.m., should be read as February 6, 10 a.m., New Style. Professor Hobbs takes it as February 5.

Under date 20 January 1821 Bellingshausen writes: "At noon our position was found to be lat. 67° 2′ 50″ S., long. 76° 29′ 42″ W. At 2 p.m. the wind shifted and blew lightly from the N.N.W. I set my course N.E. by E. ½E., with the intention of surveying New Shetland from the south in order to ascertain whether this recently discovered land belongs to the supposed Southern Continent. When I was in New Holland, I was informed by the Russian Minister at the Portuguese Court, Major General Baron de Teille von Seraskerken, that after my departure from Rio de Janeiro news about the newly discovered land to the south of Tierra del Fuego had come to hand. . . . It was not until February of the year 1819 that the island was unexpectedly discovered by Captain Smith, the captain of a British merchant brig." On January 23: "At 7.30 in the morning we reached the parallel in which we supposed New Shetland to be, and made straight for it. I greatly regretted that it was impossible to take noon observations, because our course might have taken us somewhat to the north and then with the thick weather which has set in we might easily have passed New Shetland without sighting it." On January 24: "At 7 a.m. there was a hail from the forecastle: 'Land in sight above the clouds.' We were all greatly pleased, for we possessed two pieces of information about the existence of this land; one, as I stated above, from Baron de Teille von Seraskerken, and the other was given us by the Captain of an East Indian ship,

in Port Jackson. There was a difference of 1° of latitude in the positions given in the two accounts. I relied more on the first report."

Having sighted Smith Island from the west and rounded its south-western point at noon, Bellingshausen followed the coast north-eastward at a distance of 2 or 3 miles, crossed Boyd Strait, coasted Snow Island until 10 p.m., and hauled off for the brief night, closing again at 2 a.m. on the 25th. At 3 a.m. they saw eight British and American sealers anchored near the north-eastern shore of Morton Strait, and soon after sighted Deception Island to starboard, separated from the high rocky headlands of Livingston Island by a strait 11 miles wide. "At 10 o'clock we entered the strait and encountered a small American sealing boat. I lay to, despatched a boat, and waited for the Captain of the American boat. The lead did not touch bottom at 115 fathoms. Soon after Mr. Palmer arrived in our boat and informed us that he had been here four months sealing in partnership with three American ships." He gave Bellingshausen an account of the sealing, especially of the success of Captain Smith, but there is no word of any discovery of land to the south. "Mr. Palmer soon returned to his ship, and we proceeded along the shore." By noon they were some 12 miles farther east, sailing at 9 knots, and at 2.30 p.m. they were off the mouth of English Channel.

Professor Hobbs says on p. 20, footnote 43, that the South Shetlands were "rather crudely mapped from a distance by Bellingshausen," but reproduces his chart on Plate VI opposite, which shows that he sailed along the whole southern coast at a distance of only a few miles.

Bellingshausen's account of his voyage in the South Shetlands is far more complete in detail of date and position than any other of this period, and we can follow closely the events of the morning. The point where he lay to to speak with Palmer is perhaps marked by the kink in the charted track 6 miles north-east of Deception Island. From his charted position at noon it is clear that they could not have been in touch with Palmer for more than about three-quarters of an hour at most.

DOCUMENT VII. *Voyages round the World; | with selected sketches of | Voyages to the South Seas* . . . Edmund Fanning, New York, 1833.

Page 434: "The next season after the *Hersilia's* return from the South Shetlands, a fleet of vessels, consisting of the brig *Frederick*, Captain Benjamin Pendleton the senior commander . . . and sloop *Hero*, Captain N. B. Palmer, was fitted out at Stonington, Connecticut, on a voyage to the South Shetlands. From Captain Pendleton's report, as rendered on their return, it appeared that while the fleet lay at anchor in Yankee Harbor, Deception Island, during the season of 1820 and 21, being on the lookout from an elevated station, on the mountain of the island during a very clear day he had discovered mountains (one a volcano in operation) in the south; this was what is now known by the name of Palmer's Land; from the statement it will be perceived how this name came deservedly to be given it, and by which it is now current in the modern charts. To examine this newly discovered land, Captain N. B. Palmer, in the sloop *Hero*, a vessel but little rising forty tons, was despatched; he found it to be an extensive mountainous country, more sterile and dismal if possible, and more heavily loaded with ice and snow, than the South Shetlands; there were sea-leopards on its shore, but no fur seals; the main part of its coast was ice-bound, although it was in the midsummer of this hemisphere, and a landing consequently difficult.

"On the *Hero's* return passage to Yankee Harbor she got becalmed in a thick fog between the South Shetlands and the newly discovered continent, but nearest the former. When this began to clear away, Captain Palmer was surprised to find his little barque between a frigate and sloop of war, and instantly run up the United States' flag; the frigate and sloop of war then set the Russian colors. Soon after this a boat was seen pulling from the commodore's ship for the *Hero*, and when along side, the lieutenant presented an invitation from his commodore for Captain P. to go on board; this of course was accepted. These ships he then found were two discovery ships sent out by the Emperor Alexander of Russia, on a voyage round the world. To the commodore's interrogatory if he had any knowledge of those islands then in sight, and what they were, Captain P. replied, he was well acquainted with them, and that they were the South Shetlands, at the same time making a tender of his services to pilot the ships into a good harbor at Deception Island, the nearest by, where water and refreshments such as the island afforded could be obtained; he also informing the Russian officer that his vessel belonged to a fleet of five sail, out of Stonington, under command of Captain B. Pendleton, and then at anchor in Yankee Harbor, who, would most cheerfully render any assistance in his power. The commodore thanked him kindly, 'but previous to our being enveloped in the fog,' said he, 'we had sight of those islands, and concluded we had made a discovery, but behold, when the fog lifts, to my great surprise, here is an American vessel apparently in as fine order as if it were but yesterday she had left the United States; not only this, but her master is ready to pilot my vessels into port; we must surrender the palm to you Americans,' continued he, very flatteringly. His astonishment was yet more increased, when Captain Palmer informed him of the existence of an immense extent of land to the south, whose mountains might be seen from the masthead when the fog should clear away entirely. Captain Palmer, while on board the frigate, was entertained in the most friendly manner, and the commodore was so forcibly struck with the circumstances of the case, that he named the coast then to the south, Palmer's Land; by this name it is recorded on the recent Russian and English charts and maps which have been published since the return of these ships."

Page 438: "The following season, in 1821 and 22, Captain Pendleton was again at Yankee Harbour, with the Stonington fleet; he then once more despatched Captain Palmer in the sloop James Monroe, an excellent vessel of upwards of eighty tons, well calculated for such duties, and by her great strength well able to venture in the midst of and wrestle with the ice. Captain Palmer reported on his return, that after proceeding to the southward, he met ice fast and firmly attached to the shore of Palmer's Land; he then traced the coast to the eastward, keeping as near the shore as the ice would suffer; at times he was able to come along shore, at other points he could not approach within from one to several miles, owing to the firm ices, although it was in December and January, the middle summer months in this hemisphere. In this way he coasted along this continent upwards of fifteen degrees, viz. from 64 and odd, down below the 49th of west longitude. The coast, as he proceeded to the eastward, became more clear of ice, so that he was able to trace the shore better; in 61° 41′ south latitude, a strait was discovered which he named Washington Strait. . . ."

Professor Hobbs in footnote 63 disparages Fanning, "writing as he did in his old age"—he was 64 in 1833—"twelve years after the occurrence of events in which he had taken no direct part"—yet he was joint owner of the Stonington fleet and had been described as one of the two "leaders in the enterprise" (p. 16).

If his book has defects, we should say that they are that he never gives dates; that he is sometimes vague, as in implying that Palmer traced the coast of his Land all the way to the South Orkneys; and occasionally inaccurate, as in printing 61° 41′ for 60° 41′. But he seems to have the merits of being candid and fair.

DOCUMENT VIII. A paper which Mrs. Richard Fanning Loper prepared and presented in 1907 to the Saturday Club of Stonington. Printed in the *Daily Globe* of New London, 28 January 1907.

Professor Hobbs says in footnote 20 of p. 12 that Mrs. Loper was the favourite niece of Captain Palmer . . . lived in his house until his death . . . preserved in memory as well as in written accounts, descriptions of his voyages; and on p. 19 "the account is largely that of Mrs. Loper," since it is based on a journal of Captain Palmer at the time in her possession. Some of the documents, "so far as still available," are in the Library of Congress, but apparently not the journal.

Land to the south had been seen from a height on Deception Island by Pendleton and Palmer, and on 15 November 1820 Palmer went south in the *Hero* to examine it. His account, according to Mrs. Loper (p. 18), is that "the little craft . . . flew along the wave and over billow, until she brought us in sight of land not laid down on my chart. I cruised for several days in order to satisfy myself that it was not an island."

At a later unspecified date—"one night"—Palmer relieved his mate at midnight . . . struck one bell, "which brought a response that startled me" . . . struck two bells, "that were answered by human hands" . . . was called by the mate at seven bells of the next watch, the fog lifted and two Russian ships of war were in sight, and an officer in a boat alongside the *Hero* with an invitation from Bellingshausen to go aboard the *Rostok*. Mrs. Loper gives a full account of the conversation. On hearing that Palmer had been so far as 63° 45′ S. Bellingshausen [who had just discovered and named Alexander I Land in 70° S.] "rose much agitated," asked to see the log and chart, and while it was being fetched had luncheon served; asked many questions about the sealing; examined the papers without comment, then rose and said: "What do I see and what do I hear from a boy in his teens—that he . . . has pushed his way to the pole through storm and ice and sought the point I . . . have for three long weary anxious years searched day and night for. . . . What shall I say to my master? What will he think of me? Be that as it may, my grief is your joy; wear your laurels with my sincere prayers for your welfare. I name the land you have discovered in honor of yourself, noble boy, Palmer Land."

Fanning (Document VII) made the meeting with the Russian ships on the return from the voyage of discovery to the south. Professor Hobbs says (p. 18): "Twelve days after its return from the Antarctic cruise," meaning by this the unsuccessful reconnaissance eastward 14–28 January 1821 (footnote 35), for in footnote 38 he gives the date 5 [should be 6] February 1821, from Bellingshausen. The "additional portions of the interlocution" which he attributes on p. 20 to Reynolds and to Mrs. Loper *via* Spears are all in Fanning, but the more picturesque incidents, the bells, the sending for log and chart, the agitation of the Russian and his final gesture, may be from the conversation of Palmer when Consul Bush entertained him to meet the British Admiral at Hong Kong in 1844, "written up from memory years afterward" and published by his host in a New London newspaper of 1881 (Hobbs footnote 39), if not from the Captain's journal no longer available.

We may now summarize the development of the story thus: Bellingshausen in 1831 gives a bare account of a brief meeting, and establishes the place, date, and duration, from 10 to not later than 10.45 a.m. on 6 February 1821. Fanning in 1833 complicates matters by saying it was on the return passage from the south, adds the fog, the revelation of the discovery, and part of the questions and the compliments. Bush, writing from memory in 1881 of a party in 1844, gives the eloquent passage: "I pointed the bow, etc." (Spears). Mrs. Loper in 1907 completes the tale with the bells in the night, sending for log and chart, the luncheon, and the more improbable of the compliments.

DOCUMENT IX. *Captain Nathaniel Brown Palmer.* By John R. Spears. New York, The Macmillan Company, 1922.

The author says that the Palmer family mansion was burned in 1850, but that the log of the *Hero* and other papers were saved, and that all material has been used, with the cordial aid of Mrs. Richard Fanning Loper.

Professor Hobbs often refers to Spears as authority for his statements, but has overlooked significant passages of the biography, as that "Palmer kept his log very slackly" on p. 63, or that "As soon as he had determined that a beach carried no fur seals Capt. Palmer sailed on without giving any attention to any other feature of it. . . . The land had no further interest after he learned that no seals resorted to the beaches . . . no inducement impelling him to make a survey . . . little attention given to any new coast unless it afforded a prospect for profitable exploitation. . . . These men were all sealers and not surveyors or scientists."

Spears is the only man who has given any consecutive account of what is in the log of the *Hero*. It begins on 1 August 1820. The ship was at the Falklands on October 17, at Staten Island from October 31 to November 5, reached Smith Island on November 10; Pendleton having "sent the *Hero* to search for new rookeries" she sailed from President Harbour at 2 p.m. on November 15 and stood over for Deception, cruised north round Livingston Island, found several beaches, returned to the fleet in President Harbour, and went with them to Deception Island on November 24. We have already seen that Colonel Martin has a totally different version of the same log for the same days.

Spears' history is not always accurate: he gives 1818 for 1819 as the date of Smith's discovery, and says that he was knighted. He may be forgiven for the sentence: "American and British writers were constantly nagging each other in those days."

DOCUMENT X. *Notes | on | South-Shetland, &c. | printed to | accompany the Chart | of these | newly discovered Lands, | which has been constructed | from the Explorations of the sloop Dove, | by her commander | George Powell.* London: Printed for R. H. Laurie, No. 53 Fleet-Street. 1822.

MAP H. *Chart | of | South Shetland | including | Coronation Island &c. | From the Exploration | of the Sloop Dove, in the | Years 1821 and 1822 | by | George Powell, | Commander of the same.* | Published by R. H. Laurie Chart-seller to the Admiralty, &c. &c. | No. 53 Fleet Street, London, Novr. 1st 1822. Size 36 by 24 covering Lat. 58° 20′ to 65° 25′, Long. 42° to 66°. From engraved plate with some copies coast-line and margin coloured pink. (Hobbs, Plates IX and X.)

Professor Hobbs calls this the Palmer-Powell map on p. 32, on the titles of the plates, and *passim*. On the authority of Mrs. Loper in 1907 he says that

Powell had announced his intention on his return home to bring out a map of the South Shetlands region, that Palmer's map of the South Shetlands and Palmer Land was placed at his disposal (p. 32); that the Powell map is with little doubt the Palmer map given up to Powell at Yankee Harbour [where Powell never was] (p. 33); that so far as possible practicable information has been withheld concerning this map (p. 34), though Laurie published in 1822 the "Notes on South Shetland, &c.," which, with the map, "appears to have been purposely suppressed" (p. 26 and Plate XII); that the copy at the Hydrographic Office is "an imperfect one (black base only)"; and that this is the only copy in the British Empire, whereas there are three copies at least at the Hydrographic Office, and one in private hands. The imperfection is only that the print from the engraved plate has not been disfigured with pink paint. From the statement by Mrs. Loper, that Bellingshausen asked Palmer to produce his logbook and chart, Professor Hobbs considers it proved that Palmer had already produced a map of the South Shetland Islands "so remarkable as to evoke high praise from the veteran Russian explorer."

Apart from this single reference in 1907 to a chart which may just as well have been the chart "of South America from the Equator to the highest South Latitude beyond Cape Horn," scheduled in the outfitting Memorandum of the Sloop *Hero* as "can be got at Patton's" (Spears, p. 46), that Palmer was using, there is no indication we can find that Palmer ever made any chart of his discoveries. Colonel Lawrence Martin says explicitly that among the important things demonstrated by the log of the *Hero* and contemporary documents is the fact that Palmer did not plot maps from his observations (C.R. Cong. Intern. de Géographie, Amsterdam, 1938, vol. 2, p. 216). Spears, as we have seen, explains at length that Palmer was a sealer and no surveyor. And this judgment of Palmer is confirmed in the long extracts from the "Notes on South Shetland" printed by Professor Hobbs on pp. 27–30, covering the cruise of Powell in the *Dove* and Palmer in the *James Monroe* to the South Orkneys, from 4–22 December 1821. It appears that Powell invited Palmer to go, that Powell always took the lead, that Powell and his mate determined positions, sounded, and explored, while the boat of the *James Monroe* "went only to some drift ice, to get a sea leopard," or when it had been sent to go through a strait and follow the land to the westward "had been no farther than the south-western-most point of the strait, and, finding no prospect of seals, returned on board." However, Powell put Palmer's Land upon his chart, doubtless from Palmer's information.

On p. 38 Professor Hobbs says that "In 1824 the Admiralty published the Palmer-Powell map (Pl. XV upper left)"; the fragment reproduced is labelled Admiralty (Laurie) London 1824, and at first we could not trace it. But an article in *Science* for 23 June 1939 publishes a larger fragment labelled "Portion of the first official map of Antarctic Land published by the British Admiralty" which proves to be Becher's General Chart of South America, sold not by Laurie but by Bate, that just takes in the South Shetlands. The compiler very naturally used Powell's map of these islands, as the best of the time, and so the name Palmer's Land got on an Admiralty chart. But Bransfield's map was the first official map of Antarctic land published by the British Admiralty, even if Professor Hobbs here calls it again "the unpublished but alleged map of Bransfield which I have characterized as a fake."

MAP J. *Chart* | *of* | *South Shetland* | *An Archipelago discovered* | *by Mr. Wm. Smith, in the Brig Williams,* | *February* 1819 | *Reduced from the large*

Chart | by Captn Geoe Powell. Size 8·3 by 7·0 inches, covering Latitude 61½ to 65, Longitude 53 to 65. Published by R. H. Laurie about November 1822.

Professor Hobbs (p. 35) describes this as "a copy of the Palmer-Powell map on a reduced scale . . . with a new title ascribing the discovery work to Smith," though the title says only that the South Shetlands were discovered by Smith, and a note on the face of the map says that the Powell Group (South Orkneys) was discovered by Captain Powell in 1821. (Hobbs, Plate XII.)

A later edition of this map "with additions 1828" was published by R. H. Laurie on October 22 of that year, which is not the same as that copied by Professor Hobbs on Plate XX as from John Purdy (R. H. Laurie), London, 14 August 1828. But both introduce what Professor Hobbs calls on p. 46 "the 'Hughes Bay' hoax of 1828," and "this gulf, which has no reality whatever." On p. 49 he continues, speaking of Admiralty Chart No. 1238, 1839 with additions to 1844 (Plate XX): "Without any reality whatever, the map is a stupendous hoax . . . only to disappear completely in the light of exploration. . . . The responsibility for this stupendous hoax is clearly Laurie operating in complete cooperation with the British Admiralty." But Professor Hobbs has failed to observe that the portion of the chart compiled by M. le Lieutenant de vaisseau Bongrain (Service hydrographique de la Marine, 1912, No. 5452) which he reproduces on the upper half of his Plate II shows the Baie de Hughes very much as it is shown on Admiralty Chart 3205 of the present day.

DOCUMENT XI. *Voyage towards the South Pole performed in the years 1822–24, containing an examination of the Antarctic Sea to the 74th degree of latitude. . . . By James Weddell, Esquire, Master in the Royal Navy.* London, 1825.

In this book, with several others, are:

MAP K. *Chart | of | The Tracks of the Vessels | Jane & Beaufoy | In their Southern Voyages of Investigation | in | 1820, 1821, 1822, 1823 & 1824 | by | J. Weddell, R.N.* Size 11½ by 14½ inches, covering Latitudes 41° to 75° south, Longitudes 21° to 78° west. Facing p. 1. (Hobbs, Plate XVIII.)

MAP L. *Chart | of | South Shetland | Constructed from observations | made during Three Voyages in the years | 1820, 1821, 1822 & 1823 | to these Islands | by J. Weddell, R.N.* Size 10 by 8 inches, covering Latitudes 60° 30′ to 64° south, Longitudes 54° to 63½° west. Facing p. 132. (Hobbs, Plate XVII.)

MAP M. *Chart | of | South Orkneys | Surveyed during two Voyages to these Islands | by | J. Weddell, R.N.* Size 7 by 4 inches, covering Latitudes 60° 25′ to 61° 5′ south, Longitudes 44° 20′ to 46° 35′ west. Facing p. 25.

Professor Hobbs begins a new section of his memoir with the title: "Weddell's False Map of 1825" (Map K). He says that: "his maps upon which he charted the tracks of his vessel show that he was never within the seas to the south of these island groups" (p. 39); that "he was on the north side, never nearer than 25 miles and usually much farther off" (p. 40); that "when we compare his map with the suppressed and inaccessible Palmer-Powell map it becomes clear at a glance that Weddell's map has been copied from the similar one" (p. 40); and that he "purloined from the Palmer-Powell map his chart of the South Shetland Islands" (p. 43); that "when he visited the Powell Group (South Orkneys) he kept well off to the north" (p. 42); that his coast of Bransfield's Trinity Land has "a remote resemblance to the original Bransfield map of Dr. Adam Young" (p. 43); that on his voyage towards the South Pole Weddell sailed southward "largely between the fortieth and fiftieth degrees of west longitude" (p. 44);

that "Weddell's account of his southern cruise has all the wealth of detail and colour in the account of a notorious explorer in the opposite polar region. Both clearly belong in the realm of fiction. An explorer, who, under whatever inspiration, purloined the map of the South Shetlands and falsified the map of the Antarctic Land, would hardly balk at a fictitious voyage which placed his name upon one of the grander features of the Antarctic" (p. 45).

In a communication to the Association of American Geographers meeting at Cambridge, Mass., in December 1938, Professor Hobbs repeated and in one or two points amplified these charges. An abstract of his communication is printed in the *Annals* of the Association for March 1939 under the title: "James Weddell Revealed as a Fake Explorer of the Antarctic." He said that Weddell had claimed to have penetrated in open water "between the fortieth and fiftieth meridians" the sea he named after King George IV "to a point six degrees farther than anyone has gone either before or since," and that the sea which he labelled "navigable" is "now recognised as wholly un-navigable." He repeated the comparison with a notorious explorer within the opposite polar region, characterized the narratives of both as fiction, but "unlike his later imitator, Weddell got away with it."

On receipt of this publication the present reviewer was moved to send to the President of the Association of American Geographers "privately and unofficially a friendly remonstrance against the publication of such a paper and especially under such a title," and set out seven notes upon Professor Hobbs' statements; regretted that the Association should have published a paper "with its needlessly offensive title, which will get into all bibliographies"; and asked the President to consider whether some reparation should be made in the next number of the *Annals*. The President transmitted this letter to the Editor of the *Annals*, who laid it before Professor Hobbs, and the seven notes, with his replies, are published in the *Annals* of the Association for June 1939, on pp. 167–70, following upon Professor Hobbs' paper "The pack-ice of the Weddell Sea," which is the formal presentation of the communication made orally at the meeting of the Association in December 1938 and abstracted in the *Annals* of the Association for March 1939.

Before replying in detail to Professor Hobbs it is necessary to note some of the difficulties in following Weddell's work. The title covers the years 1822–24, but there are incidental references to former southern voyages. On p. 7 he says that two voyages to which he will refer in the course of the work were performed by him in the years 1819, 1820, and 1821. On p. 132 in his account of the South Shetlands he says: "I began my observations in 1820, being the first vessel fitted out from London which anchored in these parts." On p. 129 he says: "As the South Shetlands are not yet generally known and I have had an opportunity of ascertaining some particulars in regard to them, during three voyages, a short account may here be useful for general information; and for the convenience of navigators, I have annexed a chart, constructed from observations made during my survey of these islands." On p. 133 he speaks of being the first to land on Smith Island, in 1820, and of passing Bridgeman Island, in 1821, but it is difficult to find with certainty any other reference to his earlier years in these islands.

His narrative is not easy to read because he gives the day of the month, but the name of the month only on the first day mentioned, and the year hardly ever. Since the story is by no means consecutive it is a matter of some labour to date it. It may therefore be useful to state briefly what seems to be the order of date. On 17 September 1822 (p. 8) he made sail out of the Downs in the

brig *Jane*, with the *Beaufoy*, and on 12 January 1823 (p. 20) saw the east end of the South Orkneys, on which he remarks he had landed a year before. From 14–22 January 1823 he surveyed these islands and determined several astronomical positions: the chart facing p. 25 (Map M) has a note that "the south side of these islands was examined by boats under the direction of Mr. Matthew Brisbane," who commanded the cutter *Beaufoy* (pp. 20–25). At p. 26 he was in 64° 58′ S., 39° 40′ W., and stood back to the north to search for land between the South Orkneys and Sandwich Land. On 1 February 1823 (p. 27) he turned south-east; reached 74° 15′, his farthest south, on February 20 (p. 50); decided to return; reached South Georgia on 12 March 1823 (p. 50), and, *en route* for the Falklands, searched for the Shag Rocks (p. 60). Pp. 61–69 are an account of the Spanish reports of the Aurora Islands, and pp. 69–72 his search for those islands, made on 27 January to 7 February 1820. After wintering in the Falkland Islands he proceeded towards South Shetlands on 7 October 1823 (p. 80), and interjects thirty-two pages of description of the Falkland Islands, including episodes in 1820. The narrative is resumed on p. 113, and on 29 October 1823 (p. 121) he speaks of having been battling with ice and gales since October 7 trying to get in to the South Shetlands, and compares the amount of ice with the absence of any on his two former voyages. On 16 November 1823 (p. 128) he abandoned the attempt to reach the South Shetlands, and laid his course for Cape Horn. Then follows a slight account of the discovery of the South Shetlands by Smith and all his own early work there (quoted above) on pp. 131–134.

His chart of the tracks of the vessels *Jane* and *Beaufoy* (Map K, Hobbs, Plate XVIII) shows: (1) the track from Staten Land to the reported place of the Auroras and back to the Falklands in January and February 1820; (2) a circuit made by the *Beaufoy* east of the South Shetlands in December 1821; (3) a course of the *Jane* and *Beaufoy* "on discovery" from Smith Island northeastward in January 1822 to the South Orkneys, where he was February 9–11 (Track Map K), and thence to South Georgia; and (4) the voyage into the Weddell Sea in 1823 which is the principal theme of the work. Of these, No. 1 is described on pp. 69–72. Numbers 2 and 3 are not, so far as can be found, mentioned in the book except incidentally on p. 21, the landing at the South Orkneys. Hence in spite of its title, "The tracks of the vessels *Jane* and *Beaufoy* in 1820, 1821, 1822, 1823 and 1824," it gives only fragments of information about the work in the South Shetlands in Weddell's first two voyages, while Map L, "the chart of South Shetland constructed from observations made during three voyages in the years 1820, 21, 22, and 23," shows no tracks but lays down the edge of the ice on several days in October and November 1823.

Professor Hobbs' pretension that Weddell was never within the seas to the south and on the north side never nearer than 25 miles of the islands is based entirely on the fragmentary track of January 1822 on Map K; ignores Weddell's statement on p. 129 that Map L was "constructed from observations made on my survey of the islands" during the three voyages in the years 1820–23; and ignores also the note on the map distinguishing between the shaded part of the coast (all except the northern shores of the middle islands) which he had seen himself, and the small unshaded parts, including Trinity Land, which "are laid down from the information of respectable commanders of ships."

This deals with his first two points. In reply to the third, that Weddell has copied the Powell map, it is sufficient to reproduce the outlines on the same

scale (Figs. 1 and 2) and to observe the positions assigned to Clarence Island and to Smith or James Island, the shapes of King George Island and Livingston Island. No one can pretend that such differences could be produced in copying

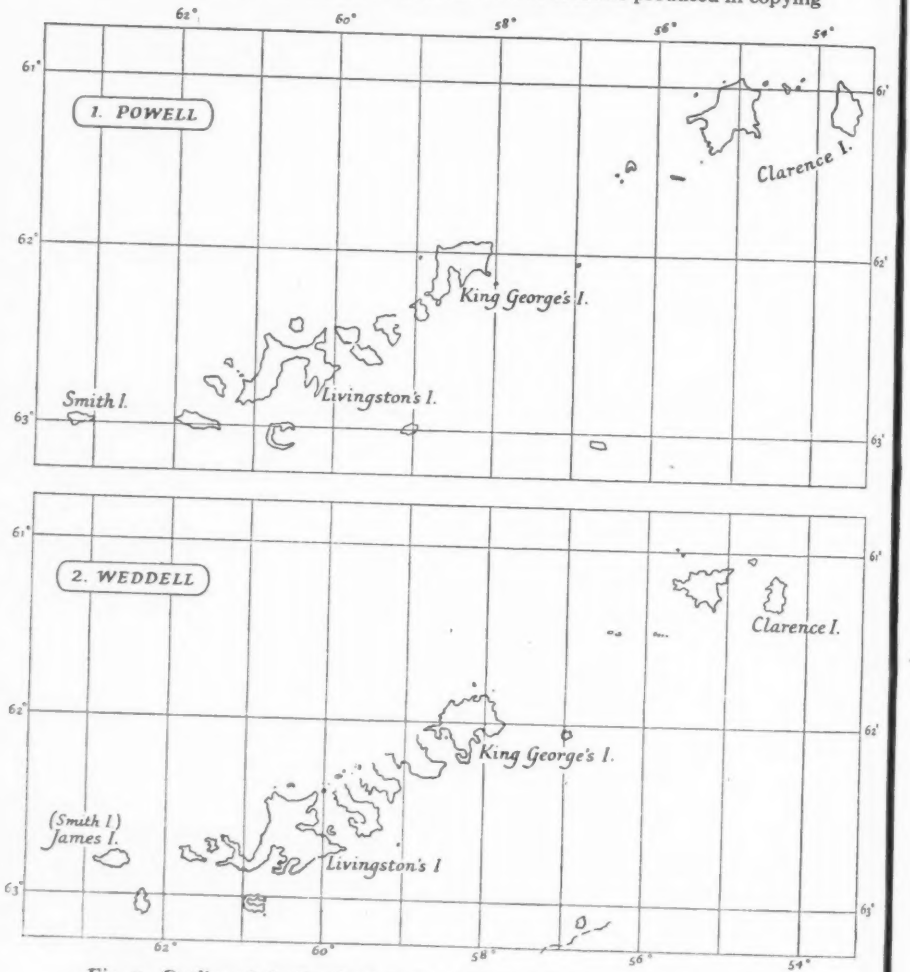


Fig. 1. Outline of the South Shetlands from Powell's map reproduced in Hobbs' Plate IX: scale of figure about 0·38 that of Powell's original

Fig. 2. Outline of the same islands from Weddell's Map L, reduced by the factor 0·46 to scale of Fig. 1: obviously not copied from Powell

the second from the first: and some similarity there must be, as they represent the same islands. Professor Hobbs has a similar drawing on Plate XVI; but having copied Map L for Weddell's outline he has falsified the representation

by introducing mutilated fragments of tracks from Map K to assist his pretension that Weddell never sailed among the islands.

At least three copies of the Powell map are in the Hydrographic Office and at least one in private hands in England. Only Professor Hobbs, more than a century later, alleges it was "suppressed." In *Annals*, p. 169, Professor Hobbs finds "the lists of features printed on pp. 40–42 of my monograph are convincing" that Weddell copied from Powell but altered many of the names. The argument appears to be that the names which are the same must have been copied, and those which are not the same altered; yet some of the names must have been property common to all the sealers, and to other features different names have been applied by different ships in these early years.

Weddell first landed at and explored the South Orkneys early in 1822, upon the voyage "on discovery," shown on Map K (Hobbs, Plate XVIII), the detailed track among the islands being, of course, impossible to show on so small a scale. We have quoted above his account of the landings and surveys with Brisbane in 14–22 January 1823, which made Map M: all this is what Professor Hobbs calls "keeping well off to the north." The "remote resemblance" of Weddell's outline of Trinity Land to Smith's or what we have called the Foster-Miers map (not Bransfield's) would have been more remote if Professor Hobbs had reproduced the two on p. 43 on the same scale instead of one on twice the other. Weddell's "Voyage towards the South Pole" was not between the fortieth and fiftieth of west longitude, but he went southwards round about the thirtieth and west of the fortieth only as he was getting out of the Weddell Sea on his return. Professor Hobbs (*Annals*, p. 167) admits an error "in reading the 3 for a 5 from the map," so that "fortieth to fiftieth" should be read rather oddly "fortieth to thirtieth." Weddell's farthest point is not "six degrees farther than anyone has gone either before or since," because Filchner in 1912 reached about 77° 55′ and Shackleton in 1915 about 76° 15′ in much the same longitudes as Weddell's.

The life of James Weddell in the *Dictionary of National Biography*, from which Professor Hobbs quotes on p. 39, says that "his Commander on the *Avon* brig in 1812, afterwards Admiral of the Fleet Sir George Sartorius, wrote of Weddell in 1839 'one of the most efficient and trustworthy officers I have met with in the course of my professional life.' " Yet knowing this, Professor Hobbs, a hundred years later, calls this officer's narrative fiction and him a Fake Explorer, because no other of the few ships which have navigated this sea has found it so open as Weddell did.

Professor Hobbs, from his experience in the North, must know that the pack-ice varies enormously from year to year. Weddell found it impossible to get in to the South Shetlands in November 1823, though he and all the other ships had had no difficulty in the four years before; indeed, Fanning says (p. 473), "The report of all (within the author's knowledge) that have passed beyond the 68th degree is, that above this latitude the sea was found to be mainly clear of ice."

For reasons which have become evident in the course of this examination we are unable to accept Professor Hobbs' conclusions. His obviously false attribution of the Foster-Miers map to Bransfield; his misdating of the articles in the *Literary Gazette* to discredit their authority; his pretence that the *Hero* was built as a survey ship for Palmer; his version of the meeting with Bellingshausen; his charges that the Admiralty suppressed and that Weddell copied Powell's map; his assertion that Hughes Bay does not exist—are all refuted by documents published in his own memoir. Having been given every facility by the Hydrographic Office to study the Bransfield charts and the map drawn by Goddard

submitted to the Admiralty by Smith, he raises no question about them at the time, but goes away and denounces as forgeries what are most evidently genuine documents, with no further proof than his own falsification of the photograph he obtained from Cornwall House. With all this he makes endless allegations of conspiracy, suppression, faking, which we have answered in the detail and need not repeat here. But we may give in conclusion one more example of his use of authorities. The *Dictionary of National Biography* in its account of Weddell says that "he was fond of reading." Professor Hobbs summarizes this as "Weddell, who could read." A. R. H.

THE ANCIENT HARBOURS OF TYRE

UN GRAND PORT DISPARU: TYR. Recherches aériennes et sous-marines, 1934–36. By A. POIDEBARD. Conclusion par L. CAYEUX. (Haut-Commissariat de la République Française en Syrie et au Liban. Service des Antiquités. Bibliothèque archéol. et hist., Tome XXIX.) *Paris: Paul Geuthner*, 1939. 11×9 *inches;* x+78 *pages; separate atlas of* xxix *plates; illustrations and maps*

THIS latest in a series of valuable publications bearing witness to the enlightened support given to manifold researches by the authorities administering the French mandate in Syria is a worthy sequel to the remarkable work of Père A. Poidebard, S.J., 'La trace de Rome dans le désert de Syrie,' reviewed in the *Geographical Journal* for January 1936. This set forth in a very clear and concise manner the results of a systematic survey of the Roman *Limes* of Syria, which, extending its border defences and roads over a wide belt of ground mainly desert, once protected that great province of the Empire and the routes serving its Eastern trade. The present publication deals with topographical and archaeological investigations in an interesting but distinctly limited area. By his treatment of the difficult and much discussed problem which this ground presents Père Poidebard once more displays both the critical thoroughness of his work and his rare skill in applying the right technical methods to his task. The masterly treatise on the Syrian *Limes* had strikingly demonstrated the great help which archaeological exploration and through it historical research may derive from aerial observation and its record by aerial photography. As Père Poidebard clearly states in the opening words of the introduction to his 'Tyr,' it was in order to apply the aerial method of research to the study of submerged ruins that he was induced in 1934 to test aerial photography on flights along the Syrian coast. This experience necessarily led him to concern himself directly with questions, archaeological in the main, but of geographical interest also, concerning the ancient harbours of Tyre.

The great importance of Tyre as the metropolis of the numerous Phoenician colonies in the Mediterranean, and for centuries the chief commercial port of the ancient world centred round that sea, is abundantly reflected in historical records. To this importance of Tyre and, in passing we might add, to that of sea-power as represented by its great fleet impressive testimony is borne by the long and arduous siege Alexander was obliged to lay to the strongly fortified

emporium before he could continue his march of conquest against the vast Persian Empire. Père Poidebard duly points out that Tyre by its geographical position on the Mediterranean coast, at the southern extremity of the mountain barrier of the Lebanon and Anti-Lebanon, was bound to serve as the natural port of Damascus. At this city the main trade routes from the Euphrates and the Persian Gulf, from Arabia and the Red Sea converged. The fact of Tyre being built on a rocky island provided adequate defence for trading establishments, and the lines of reefs stretching north and south of it parallel to the coast would make the port safer for shipping than it might otherwise have been. The construction in the course of Alexander's siege operations of a great mound from the mainland to the island had indeed turned the site of Tyre from an island into the end of an isthmus flanked by wide stretches of sand. But this change alone could not account for the fact that, where once the ships needed for an extensive maritime trade and the powerful fleet protecting it would find shelter from the violence of the winds so prevalent on that coast, there is now to be found nothing but a petty harbour sufficient only for local fishing-boats.

The contrast between the conditions thus postulated for the port of ancient Tyre and those observed at modern Sur, its successor, is brought out clearly by the classical accounts of Alexander's siege. These necessarily drew much scholarly attention to this contrast, and the problem presented by it has given rise to much learned discussion. The classical records definitely mention two harbours of Tyre, one to the north of the island and another to the south. From topographical indications and remains of an ancient mole now submerged but clearly observable, it could be concluded that the northern port was situated in the approximate position of the present harbour of Sur, though probably much larger.

With regard to the southern port the views set forth differed greatly. Along the southern face of the island foundations of walls constructed with large dressed blocks of stone could be seen partly on the surface of reefs, partly submerged. But whether these were remains of moles and quays or had belonged to ancient fortifications of the island had been left undecided by previous observations. Still more doubt was left about supposed artificial breakwaters, which tradition of local fishermen asserted to have been seen far away in shallows of the sea to the south. Breakers visible along their assumed line might well suggest that there had once existed between them and the coast a safe and extensive roadstead. But only an exact survey of the ground below the surface of the water could shed light on all these points.

This survey, involving great difficulties, constituted the task to which Père Poidebard devoted himself for successive periods during the years 1934, 1935, and 1936 with rare perseverance and skill. Initial reconnaissances by flight soon revealed the serious limitation which a variety of physical causes, such as depth and movement of the water and reflection from its surface, were bound to impose here upon aerial observation and photography. It became clear that submarine observation and photography, effected both from the surface and in the depth of the water, were indispensable for the survey.

In Chapter II of his publication Père Poidebard has presented a very lucid account of the method and elaborate means by which all the obstacles to this submarine portion of the survey were countered and successfully overcome. Effective help secured from the French naval and port authorities in the Levant provided for the correct location and marking of the points examined below the sea; for the employment of divers and the use of diving apparatus; also for the supply of the special photographic equipment permitting objects below the sea to be photographed both from the surface of the sea and by the trained

diver working below it. The latter was guided and assisted in his task of tracing and examining submerged objects by the reconnaissance dives on which one of the local fishermen accustomed to search the sea bottom for sponges was always very profitably employed. It is of interest from more than one point of view to note that this diver when descending to a depth of 12 metres was able to do heavy work there for as much as one and a half minutes. The operations were always closely watched from the surface by means of the optical instrument known to the French as *calfat*. Among these operations were the location and marking of particular points where indications known to local tradition were to be verified, the clearing of stone blocks, and the collection of rock specimens. The special ability possessed by such local divers, probably due to hereditary practice, helps to illustrate the feats recorded of Tyrian divers in connection with Alexander's siege.

The systematic direction and coordination of such manifold labours for the sake of a difficult archaeological task affords impressive proof of Père Poidebard's organizing capacity. Equally evident is the care bestowed by him upon the exact record in a number of appendices of all observations and materials collected in the course of the prolonged and arduous survey. This abundant documentation imparts additional critical value to the results set forth with much clearness in Chapter III of the report. Three detailed plans and a series of fine aerial and submarine photographs (Plates I–XXIX), among which those taken by Père Poidebard himself claim special merit, help to bring all essential features plainly before the eye of the student. Here a brief summary must suffice.

As regards the port proper in the south of the island it is now definitely shown that it comprised two large basins lying in one line, protected outside by moles of solid masonry and adjoined by quays. They were approached by one large entrance on the south and another constructed *en chicane* on the west, where protection from prevailing violent winds was specially needed. A shallower basin flanked on the east by a tower of the circumvallation of the town probably served for ship repairs. More important still, the existence of a safe roadstead outside this port, with breakwaters constructed by the hand of man, is now clearly proved. Here in a line stretching south from the south-western extremity of the island for fully 2500 metres extends a succession of reefs, all submerged except a few near the island. They are indicated on the surface of the sea by a line of breakers. It is towards their southern end that observations made with the *calfat* and confirmed by direct examination of the diver and submarine photographs have revealed remains of two separate stretches of massive walls of large dressed blocks of stone. Those facing the walls measure not less than 3 metres square with a thickness of 0·75 metre. Both stretches of walls show a uniform width of 30 metres, the northern one measuring 390 metres in length and the southern one some 500 metres. They rise vertically from the flat sandstone rock of the bottom to heights varying from 1·5 to 2 metres. There can be no doubt that these walls are remains of breakwaters. Their position shows that when complete these breakwaters would have afforded adequate protection from westerly or south-westerly winds for a large anchorage eastwards.

In view of the steady disintegration which, as shown by submarine observation, the rocks of this coast are undergoing through wave action and other natural causes, the question might well arise as to whether the blocks observed may not owe their regular appearance to some peculiar law of scission natural to the rock formation. But any doubt on this score is completely disposed of by the petrological analysis which M. Lucien Cayeux, a distinguished Member of the Académie des Sciences, has made of the specimens brought up from the

blocks of the walls, the rock of the reefs, and the sea-floor. Its results are discussed in Appendix VIII. The stone of the blocks, a kind of "pudding," differs markedly both from the crystalline limestone which forms the flat floor of the adjacent shallows and from the calcareous sandstone of the reefs. The same stone is found exposed at several points of the coast, and from one or more of these the material of the blocks is most likely to have been quarried.

Père Poidebard wisely refrains from expressing a definite opinion as to how these constructive remains came to be immersed and why they cannot now be traced elsewhere. He leaves these questions and those of the date and method of construction open for examination by the marine engineer, the geologist, and the archaeologist. The opinion of the first is recorded in a statement of the late M. Henri Watier, Directeur des Voies Navigables et des Ports Maritimes in the French Ministry of Public Works. He considered that the construction of breakwaters such as were proved by the remains photographed was perfectly practicable in antiquity, blocks of the size noted being let down with ropes and put into position by several divers. At the same time this competent expert emphasizes the difficulty created by the frequent storms of that coast, which would interfere with rapid construction. This circumstance, he pointed out, might support the suggestion made by that great authority M. Dussaud, Secretary of the Académie des Inscriptions, that these works were never completed.

To whatever conclusions further investigation on such points may yet lead, they will not affect the importance of Père Poidebard's systematically conducted and carefully controlled observations. They have established the fact beyond doubt that Tyre once possessed a safe roadstead capable of sheltering such large fleets, commercial and naval, as history shows it to have commanded in the times of Phoenician maritime greatness.

For Père Poidebard's work may be claimed also the merit of having strikingly demonstrated the great value of the help which aerial observation, if combined with rigorous control of the diver's submarine search, offers for the study of all submerged ruins. Thus Père Poidebard, by a felicitous adaptation of the method which had enabled him to search so successfully for sand-buried remains of the Roman *Limes* in the Syrian desert, has in the case of Tyre solved the question raised nearly two and a half centuries ago by that observant old English traveller H. Maundrell: "The island of Tyre . . . makes with the Isthmus two large bays, one on the north side and the other on the south. These bays are in part defended from the ocean, each by a long ridge, resembling a mole stretching directly out, on both sides, from the head of the island; but these ridges, whether they were walls or rocks, whether the work of art or of nature, I was too distant to discern" ('A journey from Aleppo to Jerusalem at Easter, A.D. 1697,' p. 64 *sqq.* Edwards, London, 1810).

AUREL STEIN

THE LOCATION OF INDUSTRY IN GREAT BRITAIN

REPORT ON THE LOCATION OF INDUSTRY: a survey of present trends in Great Britain. . . . *London: P.E.P.* (*Political and Economic Planning*), 1939. 10×8 *inches;* 314 *pages; sketch-maps and diagrams.* 10*s* 6*d*

THIS Report on the Location of Industry by the anonymous group of practical men who have adopted the pseudonym P.E.P. (Political and Economic Planning) is an important document and well repays careful study. The analysis, within its limits, is keen, and the authors are not afraid of making positive suggestions for putting an end to the present system of modified *laissez faire* and substituting a clear-cut measure of control by a permanent Industrial Development Commission. They perceive clearly that many of the evils from which industry is suffering to-day have arisen from the lack of coordination between Government departments, and the lack of cooperation between the numberless administrative units into which the country is carved up. A report on Regionalism is in preparation and its publication will be awaited with interest. The investigation of Industrial Location by the group had been begun, and much material collected, some time before the appointment of a Royal Commission with a closely similar objective, and it was only after very careful deliberation that it was decided to continue the independent survey and publish its findings in accordance with the original plan. The decision was fortunate, for whereas the P.E.P. report duly appeared in February last, the findings of the Royal Commission have not yet been published. Nor can it fail to be of advantage to have side by side the proposals of two distinct and differently constituted bodies, one of which enjoys the freedom bestowed by anonymity. For the subject of Location of Industry for peace and war is a vital one.

It must be a matter of regret for geographers that their cooperation was not invited by the P.E.P. group, but it cannot be denied that the geographer's approach to problems of economic geography, such as that under discussion, has been unrealistic and academic. Nevertheless, setting more important matters aside, a little geographical advice would have prevented the inclusion in the report of maps which are a blemish on an otherwise most admirably produced and printed volume. A few of the diagrams are coarsely drawn, but, unlike the maps, they are ably designed and present certain groups of facts that are alike fundamental and too little known. The majority are based (as were the maps prepared by this Society for the Royal Commission) on the Census of 1931, in combination with the Census of Production of 1935. Among them Fig. 5 may be singled out as particularly successful, giving on a single page a conspectus of the grouping by occupations and by regions of the total occupied population of Great Britain. Not only does it allow of regional comparison of the total number of persons employed in a particular occupational group, *e.g.* mining or agriculture, but it shows the relative importance of that particular type of occupation as compared to others within the region. If it fails to satisfy and to inform as fully as is required, and it does so fail, the fault lies, not in the conception or execution of the diagram, but in the poorly considered and arbitrary "regions" under which the Registrar-General summarizes his returns. This is a subject which was fully treated by Mr. E. W. Gilbert in a recent number of the *Geographical Journal*, and on page after page of the Report under review the handicap placed upon exact analysis by the unscientific and conflicting regional divisions adopted by different government departments finds abundant illustration. What, for example, can be the value

of a "Location Factor" relative to a region which embraces two so diverse and unrelated areas as West Cumberland and the East Riding, which form part of the Registrar-General's N II, here named the Northern Rural Belt? Yet the Location Factor (devised and developed by Professor Sargant Florence) is an extremely important concept, and should prove a valuable statistical tool in the hands of the geographer as well as of the economist. Briefly it is a coefficient obtained by dividing the percentage figure of workers in a particular group (*e.g.* tool-making) located in a particular region by the percentage figure of the total working population of Great Britain who are found in that region. For occupations such as building, baking, or similar services which "follow the population" the coefficient approximates to unity. A coefficient of 2 or more indicates significant concentration, *e.g.* for workers in wrought iron and steel tubes in the West Midlands the coefficient is 5·2. This method of occupational analysis should be compared with the one (unfortunately too little known) that was devised by Dr. E. W. Selwood and outlined by him at the British Association Meeting in 1938. He has applied his technique to the whole of Great Britain and produced a map which was the basis of the one termed "Dominant Regional Interest" in the portfolio of maps prepared by the Society for the Royal Commission. In this connection it is interesting to note that P.E.P. agrees with the Society's Memorandum in attaching importance to the psychological "tone" given to thought, action, and response in a particular region by the prominent occupational groupings.

A geographer reading this study of location cannot but be struck by the lack of appreciation of differences of terrain which is obvious throughout, the impression being given that as between, say, the "East Midlands" and the "South-West" the geographical contrast is purely one of position. It is true that such facts are recognized as the tendency of rich men (capable of financing new enterprises) to live in and therefore to favour the south-east, and the tendency of well-to-do retired persons (with spending power on consumers' goods) to move to the south. These tendencies however, though in fact geographically based, are treated rather as idiosyncracies comparable to that of the piano-frame manufacturer who located his factory on an Essex creek for his personal convenience as a yachtsman.

A keener geographical consciousness would undoubtedly have added something to the value of the report, but as it stands it is an extremely valuable and weighty document. Richly informative as it is, its boldy constructive proposals (*e.g.* for the complete evacuation of towns and villages of the "derelict mining camp" type) have the greater force in that they clearly emanate from a band of thinkers whose sole criterion of good is the balanced welfare of the nation as a whole, now and in the years to come.

E. G. R. TAYLOR

REVIEWS

EUROPE

A GATEWAY OF EMPIRE. By C. M. MacInnes. (*Bristol*): *Arrowsmith*, 1939. $9\frac{1}{2} \times 6$ *inches; 456 pages; illustrations and maps. 15s*

This book is a combination of local and imperial history in which Bristol's connection with the empire is traced from the fifteenth century to the present day. Bristol played a great part in the voyages of discovery of the late fifteenth century and with the opening up of America developed considerable trade with Newfoundland, New England, and, later, Virginia. The port, too, became a gateway through which many emigrants, often indentured servants, passed to the New World. With the development of the slave trade Bristol became more and more closely bound to the West Indies, so that in the eighteenth century her prosperity rested on the West Indian trade in general and on the sugar trade in particular. Her merchants not only traded in sugar but often owned the plantations. This prosperity rested, as Mr. MacInnes shows, on a narrow and precarious basis of specialization and could not survive the abolition of slavery and the destruction of the Old Colonial System. Thus by the middle of the nineteenth century Bristol's great days were over and though she ultimately developed new lines of trade towards the end of the century, there was never any chance of her regaining the position of second city, which she had held when "sugar was king." Mr. MacInnes brings out clearly the great rôle that Bristol has played in imperial development. Of special interest are the chapters on early emigration, on the attitude of the commercial classes of Bristol towards the American War of Independence, and on John Pinney, planter and merchant, whose business papers have survived. More attempt might however have been made to give a quantitative analysis of Bristol's colonial trade, for which materials exist, and one or two specific points appear to need correction. It is scarcely true to say that in the eighteenth century "all Irish goods sent oversea had first to come to England" (p. 219), for Irish provisions could be shipped direct from Ireland to the colonies (under 15 Car. II, c. 7, s. 5) and the provision trade was important. The Act of 1785 (p. 222) apparently refers to Pitt's commercial propositions of that year, which were abandoned, but this is not clear from the context. Finally the value of the Bibliography is impaired by the lack of any intelligible arrangement of its contents. T. S. W.

EUROPE. By J. F. Unstead. (A systematic regional geography. Vol. II.) *London: University of London Press*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii+356 *pages; illustrations and maps. 7s 6d*

By reason of the intricacy and complexity of the subject, writing an introduction to the geography of Europe is a formidable task, making exceptional demands on an author's power to select and expound essentials. We can well appreciate, then, that Dr. Unstead, who has made Europe a special field of study for many years, deferred publication of a book till his active teaching ended. And there is no doubt that maturity of judgment has imparted original and valuable features to the plan. After the introductory chapters on general geography (covering relief, climate, natural vegetation, soils, land utilization and peoples, though not minerals, or commercial and industrial development, or the distribution of population) the main body of the book is a substantial treatment of the regions of the continent. The existence of regions, the original character of these regions, the use the inhabitants have made of them constitute the essence

of human geography for Dr. Unstead, and while doubtless he would be among the last to deny that a State can exercise considerable influence on the development of a region, he would not have the pupil absorbed in this aspect of the subject at an early stage. Actually a brief third section is devoted to grouping European States, and to examining the common characteristics of each group.

It is a little unfortunate that more thorough revision of a book written on such admirable lines could not have been undertaken before publication. Simplicity of vocabulary and style, together with rigorous condensation of subject-matter, is no doubt vital; but some rather vague sentences have been allowed to stand, *e.g.* "the breaking up of the old massif led to the broad outlines of the present peninsula" (p. 137), and "differences in situation, structure, climate and human occupation are other factors which have determined their respective natures" (p. 193). On p. 131, it is stated that "the River Seine is now navigable between the sea and the capital"; implying that navigability was not an original attribute of the stream, when in fact riverine traffic contributed to the prosperity of the city in both Roman and medieval times. It is surely time that maps in English textbooks began to reflect the new technique of representing land forms on a small scale (devised by Davis, de Martonne, Lobeck, and Raisz) and improved methods of portraying statistical material. Many of the so-called "structure maps" are no more than simplified geological maps. But in spite of this, teachers will find here a useful textbook for Higher School candidates.

J. H. G. L.

GUIDE TO NORWAY, SWEDEN, DENMARK, FINLAND, ICELAND. Seventeenth edition. Edited by T. G. BARMAN. *London: Thos. Cook and Son*, 1939. 7×4½ *inches;* 520 *pages; maps and plans.* 10*s* 6*d*

This comprehensive and fairly inexpensive guide to northern Europe has now reached its seventeenth edition, which is a reflection of its excellence as well as of the increasing interest which the Scandinavian countries hold for travellers. Among the several attractive features of this guide are legibility and ready reference brought about by the clear type selected, with frequent sub-headings in bolder lettering. A number of physical maps by Bartholomew, mainly on a scale of 1/M, together with some street plans of the larger cities, are designed to give the maximum assistance to the tourist. Some linguistic pitfalls may be overcome by reference to a glossary drawn up "mainly to enable the traveller to detect the elements in the place-names which represent physical features," although this latter term has been stretched to include the Scandinavian and Finnish words, for example, for a railway station. The book is divided into five sections and each country has a general introduction, followed by some historical notes and "practical information." Under this latter heading a number of routes are selected and described, and points of interest in connection with each are given, corrected to 1939. It is a pity that the nineteenth-century legacy of "flora and fauna" has been maintained, and that the compilers' concept of geography is so limited that "climate" is reserved for a separate heading. Some inaccuracies have almost inevitably crept in, but the publishers admit the possibility of this and invite criticism from readers. Some of the most jarring statements concern the effect of the "Gulf Stream" on this part of Europe (p. 11 and again on p. 219). In Sweden "rudimentary rocks [were] formed prior to the glacial period and the subsequent later deposits of softer soil" (p. 215). Skåne does not belong mainly "to the Chalk system," nor does this formation characterize in their entirety "Denmark and the Baltic Provinces." The coast of Sweden is described as fringed with "wooded islands," but no reference is made in contrast to the rocky "Skårgard" along the coast

between Göteborg and Varberg. Apart from such blemishes as these, the guide provides a most useful compendium of information for those travelling over frequented or unfrequented ways in northern Europe. A. F. A. M.

LES HAUTES MONTAGNES DANS LE ROYAUME DE YOUGOslavie: étude géographique. By BORIVOJE Ž. MILOJEVIĆ. *Beograd: Société de Géographie*, 1939. 9½×6½ *inches;* 284 *pages; illustrations and maps.* 100 *dinars*

This monograph, the fruit of many years' research and field work in western Yugoslavia, is a valuable contribution to our knowledge both of the Dinaric region and of mountain geography generally. Both physical and human aspects of the subject are considered in some detail.

Geomorphologists will find much of interest in the discussion regarding the evolution of local valley features in some parts of the region. The complex origin of alpine landforms is, for example, clearly demonstrated. While due attention is paid to the importance of ice erosion and deepening, it is also shown that many apparent examples of ice action are really the result of either normal "karstification" in limestone valleys or, more strikingly, of polycyclic valley denudation in the Pliocene, over which ice action has passed merely a superficial touch. This is a point of view that seems to receive insufficient attention from many geomorphologists. Plant geographers will welcome the discussion of the varied natural and artificial influences on vegetation zoning. There are interesting examples of variations of level due to changes of aspect, and of the less common "inversion of vegetation" (*e.g.* coniferous forest belts below the deciduous zone in valleys of the Kamnik Alps) resulting from the frequency of temperature inversion.

On this detailed study of the physical setting there follows an analysis of the rural economy of the region, and a review of its social and political geography Population, village distribution, and transhumance are considered, and the special character of a karst region where "mountain" and "Mediterranean" influences meet. Considerable attention is devoted to the problems of transhumance which here may assume a somewhat special character due to the interplay of varied geographical, social, and historical factors.

The Geographical Society of Belgrade is to be congratulated on adding this interesting monograph to a series notable for valuable research work on Yugoslavia to which Professor Milojević has already contributed and directed other important works. A. Gt.

ASIA

THE NEGRITOS OF MALAYA. By IVOR H. N. EVANS. *Cambridge: University Press*, 1937. 9×5½ *inches;* xiv+324 *pages; illustrations and map.* 25*s*

Mr. Evans sets out in this volume the salient points of all that has been recorded on the Malayan branch of these interesting little people who were, in the opinion of many anthropologists, the earliest inhabitants not only of Malaya but of other large areas of Indonesia. Always lovers of the valleys rather than of the high ranges where they might have lived isolated or uncontaminated, as great numbers of primitive folk lived in New Guinea till the gold-seekers came, they are now largely parasitic on the Malays and Chinese of the lowlands, with whom they barter medicinal herbs for "luxuries" and by whom they have been taught evil ways and infected with epidemics. Their numbers are steadily falling, and this the author attributes chiefly to diseases to which they have never had time to become immune. The end must soon be in sight, and for this

reason Mr. Evans' record is all the more valuable. It is based not only on the writings of older authorities, but on personal observations extending over nineteen years. There are chapters on the appearance of the Negritos, their mode of life, their material possessions, and every aspect of their existence. One could have wished for more information on the organization of the "groups" in which they live, on what constitutes a group, and on the relation of the members with one another. The first-hand information on birth and death ceremonies and such-like matters is likewise scanty. This intimate knowledge however can be gained only by actual residence with some group, and this was impossible for the author. He has however paid many visits to numerous groups scattered over a wide area, and the real friendship he felt for these little folk is proved by the valuable information on religion which they would never reveal to one whom they did not entirely trust.

The author describes his book as a compilation of Schebesta's work and his own, plus that of Skeat and his authorities. Schebesta is the only other great modern authority on this area, and it is his importance as a source which justifies the frank criticisms made on occasions by Mr. Evans. J. P. M.

KARAVAN: travels in eastern Turkestan. By NILS AMBOLT. Translated from the Swedish by JOAN BULMAN. *London: Blackie and Son*, 1939. 9 × 6 *inches;* xiv+192 *pages; illustrations and route-map.* 15*s*

Sven Hedin came at the end of the great age of the solitary travellers, who, though they were often accompanied by large caravans, worked alone in making the observations on which their more permanent scientific reputation is based. Of these travellers very few have taken up the newer technique of the multiple expedition, which places a number of scientific specialists in the field in such a manner that each man's work supplements that of several others; but in this kind of exploration Sven Hedin again reached the front rank. His Sino-Swedish Expedition of 1928–33 was notable for a number of things: a large number of Chinese scientists took part; the expedition operated in Mongolia, Chinese Turkistan, Tibet, and western China; it kept the field continuously; and its winter work is probably more notable than that of any other expedition.

A number of books by Hedin's assistants have now appeared. They are as different from each other as the men who write them, but they all show that Hedin, when recruiting specialists, chose them for versatility and enterprise, and developed in them not simply the technique of discovery but the zest of travel. Ambolt worked for six years in the great central desert basin of Chinese Turkistan, and also penetrated the most bleak uplands of Tibet. Part of the time he worked with Norin, the geologist, but for much of it he was alone. He carried out geodetic observations under very trying conditions, did a great deal of mapping, and made botanical collections. In this brief book Ambolt is extremely modest about his own achievements and does not attempt a connected record of his explorations. He merely sketches, lightly and often sentimentally, scenes of the camp and the road, the companions with whom he worked, and the many kinds of people he encountered. As with many travellers in central Asia, his Chinese are least real; but his Turki oasis dwellers and desert wanderers are delightfully real; so is Vorotnikoff, his young Russian assistant, and Tomes, the Mongol.

Neither Hedin himself nor any of his young men whose books have thus far been published have given an adequate account of the Moslem rebellion of 1932 and 1933, though they saw a lot of what happened. Ambolt himself was caught on the remote south side of Chinese Turkistan, and had a very trying time, but extricated himself by bluff and nimbleness. Though he says nothing

about the causes of the rebellion or its probable results, he vividly describes a few scenes of violence and confusion. The first part of his book shows why revolution in such a land is necessarily savage: ignorance, isolation, and lack of the habit of fighting seem to breed a special hysteria when oppression, always taken for granted, suddenly reveals that it is unable to maintain itself by force. One of Ambolt's most convincing brief passages is the description of the lanterns flickering among the tamarisk mounds, out in the reeds and camel-thorn, as people hastened to bury their valuables, laying up treasure for future archaeologists. Changes of power in central Asia have always been sudden and calamitous.

An annoying minor defect of the book is the rendering of Turki and Chinese names and words. Publishers and translators have no excuse for not converting these to the standard English transcription. O. L.

PEASANT LIFE IN CHINA: a field study of country life in the Yangtze valley. By HSIAO-TUNG FEI. *London: George Routledge and Sons*, 1939. 9×5½ *inches;* xxvi+300 *pages; illustrations and sketch-maps.* 12*s* 6*d*

Of all the complex movements which are rapidly changing "The Unchanging East" there is none more fundamental than that which is giving self-consciousness and awareness to the vast peasant communities which constitute the great majority of its populations. Their traditional passivity is disappearing, and upon their changing status and outlook largely depends the future rôle which India and China will play. No line of research is more valuable than that which analyses and interprets the factors affecting the economic and social conditions of their lives, and this field of investigation is appealing to many of the young scholars of China. A small part of the large amount of field research into basic problems of the rural life and organization of their country which Chinese scholars have carried out in recent years has recently been made available in English by the Institute of Pacific Relations, but no social survey known to the reviewer is more illuminating than this which Mr. Fei has made of the large village of Kaihsienkung, near Lake Tai in the rich Yangtze delta, about 80 miles west of Shanghai. The rehabilitation of the Chinese rural community in harmony with its new world environment is for the author the ultimate purpose of such investigations, but no prepossessions as to the causes or solution of its problems are intruded into the analysis of the existing situation. "A common-sense judgment based on reliable information" is the end which he sets before himself and which he achieves.

Mr. Fei carefully describes the lay-out of the village and its geographical environment, dominated by its canals. He analyses the social organization, with its nucleus of the *Chia* ("expanded family") and the precise status of its members, the kinship extensions outside the *Chia* and the social obligations which they involve; territorial as distinct from kinship bonds and the mutual help of groups of households, together with religious and recreative groups, leading up to the government of the village as a whole and the function of the headman. He then deals with livelihood in all its aspects, occupational differentiation, and a very minute and instructive calendar of work and of related social and religious activities. Agriculture; the silk industry, which, although supplementary to the main subsistence crop (rice), is the chief commercial asset of the village and the most affected by external factors; supplementary sources of livelihood; and marketing and finance are all treated in turn.

If the earlier chapters enable us to appreciate the traditional social mechanism and conventions by which Chinese communities have succeeded in living together *en masse* on very limited resources with a minimum of friction, the

later reveal the grave economic problems with which they are now faced. The extreme difficulty, for example, of introducing the modern machinery and methods necessary to successful competition in world markets in such commodities as silk, without displacing skilled handicraft labour and undermining the stable social structure, is illustrated by recent attempts at sericulture reform and the establishment of a cooperative silk factory in the village. In spite of difficulties and failures the author welcomes it as an experiment in preventing "the concentration of ownership of means of production . . . characteristic of capitalist industrial development in the West" and believes that China "as a late comer in the modern industrial world is in a position to avoid those errors which have been committed by her predecessors." This survey and other more general studies which, in the form of excerpts, have been recently collected into a volume entitled 'Agrarian China,' issued by the Institute of Pacific Relations, demonstrate the increasing poverty of the Chinese peasant and the communist movement as in the main "a peasant revolt." The causes of this increasing poverty and the methods of combating it can only be established through dispassionate and scientific surveys of this kind. It is a model which one hopes may be followed by other equally detailed studies of village communities in different parts of China. P. M. R.

KARTENWERK DER ERDMAGNETISCHEN FORSCHUNGSEXPEdition nach Zentral-Asien 1926–28. Zweiter Teil: Tibet II. By WILHELM FILCHNER. (*Petermanns Mitt. Ergänzungsh.* Nr. 231.) *Gotha: Justus Perthes*, 1937. 11 × 7½ *inches; 236 pages; illustrations and maps. M.20 (M.15 abroad)*

The three earlier volumes dealing with Dr. Filchner's journey of 1926–28 were reviewed in the *Journal* for May 1934. The most recent one deals with the final part of the journey, in central Tibet, approximately between north latitudes 30° 30′ and 33°; and east longitudes 86° and 93°. It consists mainly of a very detailed route report and diary from 18 August 1927 to 3 January 1928, when Dr. Filchner was escorted south by the Tibetan Government, and his work came to an end; with 31 pages of notes by O. Wand, the draughtsman, on the astronomical positions and fixed points used in making the two beautiful maps, and on the work done by previous explorers in, or near, the same area.

With work of this kind, dealing with indisputable fact, and connected with a relatively small and highly specialized area, a review can only concern itself with the book as a whole; and this book is magnificent. It should be studied not only by any one who may be intending to work in central Tibet, but by all travellers to little-known parts of the world. Dr. Filchner made this journey with no more than two objects in view, both closely interrelated: to make an exhaustive series of observations on terrestrial magnetism, and to make a geographical survey of the area he covered. Most modern expeditions have, almost of necessity, a comparatively large number of aims, and few members to carry them out in the fullest detail. But even with no more than the two objects mentioned above, Dr. Filchner has carried them out with such painstaking accuracy and efficiency that it is amazing to think that he was able to finish them both. There is a list of all place-names on the two maps, with the correctly transliterated Tibetan spellings and most accurate translations, which will be invaluable to later travellers. The route report and diary are enhanced by small sketches in black and white, not only of topographical features, but of such things as types of buildings, hats, ornaments, mangers, ovens, and prisoners' chains peculiar to certain districts. At each survey station he made a large-scale sketch-map of the immediate neighbourhood to show the exact position of the plane-table (these are printed at the back of the book); and finally there

are the two main maps themselves, masterpieces of draughtsmanship and printing. They are produced on a scale of 1 : 500,000; in six colours; perfectly in register; and clear down to the least detail. R. K.

AFRICA

THE LAND OF EGYPT. By ROBIN FEDDEN (H. ROMILLY FEDDEN). *London: B. T. Batsford*, 1939. 9×6 *inches;* viii+120 *pages; illustrations and sketch-map* (*by A. Costa and others*). 12*s* 6*d*

The 129 illustrations are a remarkable feature of this book. The frontispiece, Karnak, is from a water-colour, the rest are from photographs, mostly by A. Costa. Though many of them are placed appropriately with the pages concerned, none of them are referred to or described in the text, and it seems possible that the author had little to do with them. He would hardly have passed the interchange of titles of 65 and 66 where the Great Temple of Abu Simbel is said to be the smaller one and *vice versa*. This is more remarkable as 67, showing part of the Great Temple, is correctly named. People in 14 are said to be swimming down the Second Cateract on buffalo skins. If this were a fact it would require a lot of explanation, first as to where the skins are obtained and then as to why such cumbrous things are used. Nevertheless, those who know Egypt will enjoy this collection of views.

In the text we are told that sagia oxen are blindfolded (*cf.* Fig. 18), that the Aswan reservoir contains 23,000,000 tons of water, and that the flood-water with its rich deposit of silt reaches the cultivated areas by "free flow." Actually the Aswan reservoir holds some thousands of millions of tons of water and the free-flow water from the reservoirs is clear of silt. But though there are now no crocodiles to shoot and fewer mummies to be bought, Egypt, as our author tells us, has preserved her eight thousand years and the visitor can enjoy them with a minimum of effort and trouble. The author has climbed to the summit of the second pyramid and motored across the desert where "time is water," and he came on the entrancing view of the Gulf of 'Aqaba. Without entering into politics we have an excellent account of the people, their industry, conservatism, and *savoir faire* without culture. They could execute but not conceive as did the Greeks; hence their massive architecture. Turning to Alexandria he admires the figures in the Museum and asks: How could these charming and civilized people have coped with the encroachments of Nile silt, Islamic intensity, or Christianity?

A list of the figures would be useful, but many of them are referred to in the index. There are useful end-paper maps showing the principal places along the Nile valley from Wadi Halfa to the sea. While the book has an entertaining account of contemporary Egypt it is neither detailed enough nor sufficiently reliable in its present form to be of permanent value. G. W. G.

LA SOMALIE FRANÇAISE. By E. AUBERT DE LA RÜE. (Géographie humaine. Edited by P. DEFFONTAINES.) *Paris: Gallimard*, 1939. 9×5½ *inches;* 162 *pages; illustrations.* 40 *fr.*

Dr. Aubert de la Rüe spent the cool season of 1937–38 on a geological and botanical reconnaissance of the Côte Française des Somalis. The present book is intentionally popular, to avoid trespassing on the field of his official report. The greater part is therefore a simple account of his travels in this hard country, and he travelled with very few comforts. That he was able to move about as he did proves how the French have extended their authority in recent years. Only ten years ago excursions away from the few Government posts or the railway were distinctly risky. The Esa (and perhaps the Danakil too) used to amuse

themselves by menacing inadequately protected European parties, whom they would allow to escape on surrender of virtually their whole stock of funds or, preferably, rations.

Dr. Aubert de la Rüe paints a very fair picture of this country, with its grim aridity which yet provides such unexpectedly interesting, and even attractive, localities, and its often imposing mountain scenery. At the end of 1931 hopes were entertained in Djibouti of establishing a hill station in the Goudah Mountains; for, through lack of one, the Governor and every European, official or unofficial, who was not obliged to remain in Djibouti during the hot weather, transferred their offices to Dira Dawa or Harar—a truly remarkable state of affairs. The author explains the failure of this scheme.

The least satisfactory side of the book is its account of the natives, no doubt primarily due to the brevity of the author's visit. He does not seem to be sure in his own mind that the Esa (Issa in French) are Somalis. He suggests that they are wilder, fiercer, more quarrelsome, and more treacherous than the Danakil. All Somalis are of course excitable, and the Danakil are recognized by the French military authorities as being steadier; but, to say the least, his comparison is hardly borne out by general experience. His description of the women's coiffure is incorrect so far as the Esa are concerned. In all Somali tribes the girls have their hair uncovered, and only rarely braided; a married woman always wears a head-cloth arranged to conceal her hair, giving a neat silhouette. He is also at fault as regards their clothing. From early childhood every Somali girl is fully clothed, in a style that is most becoming even when reduced to rags. Danakil girls and women, on the other hand, are not infrequently naked above the waist.

Little is said of the game. Gazelles are mentioned without further definition, but no other varieties. It has been reported that there are Greater Kudu on the Goudah Mountains; confirmation would be interesting. Nor is information on the bird life vouchsafed.

In the last chapter an excursion to the extreme south-eastern corner of the territory is described, and it is evident that Dr. Aubert de la Rüe has been misled in a number of respects by his guide; reliable guides are extremely difficult to obtain for this area. Thus, to quote one instance, the tri-junction boundary pillar (British Somaliland–Côte Française des Somalis–Ethiopia) is not on the hill of Jalelo, but on the next hill to the west.

A sketch-map is provided which serves to illustrate the author's travels, but could easily have been much improved. A regrettable feature is that the spellings in the text in many cases do not agree with those on the map, while both on occasion differ from accepted official usage. The numerous photographs are well chosen and reproduced, but are arranged without any reference to the text.

The author visited Djibouti at an unfortunate moment when the drain on the water supply was so severe that infiltration of sea-water was occurring, though the wells are 5 kilometres from the shore of the Gulf of Tajura. Since then however the necessary development work has been carried out and the former quality of Djibouti water has been restored, with the same high content of magnesia salts.

The book ends with a bibliography which shows how little knowledge is yet available of the country. But it seems probable that the process of opening up the interior will now be continued energetically, particularly in view of the recent frontier difficulties, so that further information may reasonably be anticipated in the near future. It is nevertheless to be regretted that Dr. Aubert de la Rüe did not set himself a somewhat higher standard of authenticity in matters outside his special fields of geology and botany. E. H. M. C.

CARTOGRAPHY

AIR NAVIGATION. British Empire Edition. By P. V. H. WEEMS. Edited by A. J. HUGHES and P. F. EVERITT. *London: McGraw-Hill*, 1937. 9×5½ *inches;* xiv+490 *pages; illustrations and maps.* 30*s*

Until quite recently, air navigation has been seriously neglected with disastrous results; a large proportion of accidents to aircraft can be traced directly or indirectly to bad navigation. In the early days of flying, instruments were so bad that pilots formed the habit of flying by "Bradshaw," that is to say by following railways, rivers, and prominent landmarks. This was not so fatal when planes were doing 80 miles an hour and only in good weather. The modern plane however must fly in all weathers and is travelling at 200 or 250 m.p.h.; consequently, if it gets off its course and loses its way it is a most serious matter. Navigation is now being studied strenuously by air-line pilots and young aviators. The difficulties are considerable: not only lack of experience, rapidly increasing aircraft speed, and shortage of instructors, but also deficiency in instructive literature. A number of books have been written on air navigation, but they have been too difficult and too technical for the student; the novice has tended therefore to get along as well as he can without them, knowing that he can fly from A to B without any special knowledge of navigation when conditions are easy. He may be able to carry on for years in this manner, but in the end will probably be caught in difficult circumstances at night or in stormy weather when lack of navigational skill is fatal.

The present book is well laid out, sections being devoted to pilotage, dead reckoning, wireless telegraph direction-finding, celestial navigation, blind flying, and meteorology. It is important first because it explains air navigation in plain language which the student can understand. At the same time, each simple explanation is built up and developed to a high standard. Thus, after reading the section on compass adjustment, a student would feel himself capable of going straight off without previous experience and successfully swinging a plane; and the instructions are so concise that he could do so. Secondly, the book will satisfy the navigator as well as the novice. However skilful he may be he will find plenty that he does not know, and also he will be able to revise much of what he does know. Moreover the book is well written, and one enjoys reading about methods, instruments, and even terms which one knows perfectly well.

The best section is undoubtedly that on celestial navigation, which occupies a quarter of the book. It satisfies equally the skilled air navigator, the student, the marine navigator, the astronomer, and the surveyor or "ground" navigator who is interested to know what is being done about celestial navigation in aeroplanes. The navigator is taken carefully stage by stage from time, through almanacs, equipment, sextants, timepieces, observations, into positions, precomputed altitude star curves, navigation before flight, to navigation in flight, in a simple and complete way, so that finally he can know all that is necessary about the theory of celestial navigation. Little need be added for this part to suffice as a text-book for candidates for the First Class Air Navigators' Licence.

For the skilled navigator there are short descriptions of many recent improvements in air celestial navigation, which is developing fast, and all the different ways of reducing sights to positions. He may be highly skilled and yet use only one method, knowing little of the others; he may not feel inclined to buy all the different kinds of tables and computing instruments to try them out, and yet may wish to know roughly the principles. He will find the general survey of the many and varied tables in use of great interest. Fuller explanations

of some diagrams, such as Rust's Azimuth diagram, and of the position-finding machines, might have been given.

Lastly, the marine navigator and the surveyor will be interested in the recent advance in air celestial navigation. There has been a revolution in the art of position-finding; and the lessons learned from work in the air are, or could be, of great help to the marine navigator at night or whenever, the horizon being invisible, he could not use an ordinary sextant. The new Air Almanac gives the navigator his G.H.A. in arc for the moment of observation, thus saving him the trouble of using R. or Right Ascension, sparing him the conversion of longitude into time, and the conversion back of the hour angle, when obtained, into arc. There are also the methods developed for reducing sights. The Bygrave Position Line Slide-rule, for example, would enable a mariner to check his working to a one-minute accuracy in two or three minutes of time. It is in working six-figure quantities that mistakes are liable to be made, and nothing could demonstrate this more clearly than trying to work them in the air. At high altitudes or in strong winds the brain seems to freeze up. Consequently, air work caused the Bygrave to be evolved. Only one small addition of two quantities in arc has to be made in a computation; the rest is a matter of manipulating a cylindrical slide-rule. The air, too, is responsible for the new Hughes-Comrie tables, which are easily the most simple compact tables yet produced, whenever one may work with assumed position to the nearest whole degree. Little practice would be needed to compute an altitude and an azimuth in one minute. Addition of two quantities has only to be made twice, and the tables entered three times, in computing an altitude. Each degree of latitude has a page and from the line on it for the given hour angle two quantities are taken out. One, combined with the declination and looked up in another table, gives a third quantity, which, when added to the second, and converted to arc from the same table, gives the required altitude. The azimuth comes out just as simply from the same tables. It is necessary of course to use integral degrees of latitude and hour angle in the Chosen Position, which may not suit all marine navigators, but the tables will always provide a valuable rapid check on the ordinary cumbersome computation. For the air navigator, working away from a distant point is the best possible practice.

Two chapters describe the navigation on an actual flight—that of Ellsworth and Hollick-Kenyon in the Antarctic. The last section of 100 pages on meteorology, by Dr. Sverre Petterssen, contains extremely interesting subject-matter, but is not written in the same easy style as the rest of the book. The explanation of the various weather conditions which cause icing-up, and the different forms that this can take, makes one wonder whether there are still more freakish weather conditions causing serious icing-up which are yet to be discovered. F. C.

ECONOMIC AND HISTORICAL GEOGRAPHY

THE RAPE OF THE EARTH: a world survey of soil erosion. By G. V. JACKS and R. O. WHYTE. *London: Faber and Faber*, 1939. 9 × 5½ *inches; 312 pages; illustrations.* 21*s*.

It is greatly to be hoped that the unfortunate title and a journalistic style will not deter readers from studying this important book. It is almost the first attempt to survey the world problem of soil erosion in a single book for the general reader, who is as much concerned as the actual user of land.

The authors first survey soil erosion in different parts of the world (chapters I–VII) and then proceed to general considerations and remedial measures. The matter is so urgent that nothing more is wanted than a plain statement of the

position, and it is regrettable that in parts the authors have been guilty of serious exaggeration which can but harm their general thesis. After acknowledging that geological erosion is a universal phenomenon without which man would have died long ago (p. 19) it is rightly said that the same process accelerated by human mismanagement is one of the most vicious and destructive forces ever released by man. The cycle of erosion is in fact so fundamental a concept of the geologist that, until the world is reduced to an endless succession of sub-aerial peneplains which have reached base level, it is clear that erosion must go on. Hence the erodibility of soils is a question of fundamental importance, and it seems absurd to claim that "no undisturbed mature soil exhibits any appreciable erodibility, otherwise it would have disappeared long ago" (pp. 93–4). Similarly to credit the silting of Aegean gulfs entirely to man-induced soil erosion (p. 42) is to neglect the ordinary processes of deltaic accumulation. The Japanese engineer (p. 91) treats the control of soil erosion as a game of chess: he makes his move and watches for Nature to make hers. The moves which Nature will make are well known to the physical geologist; they must be allowed for, but not denied. It is however rightly stressed that disastrous flooding of such rivers as the Mississippi and destructive dust-storms of huge extent result from man-induced soil erosion; they cannot be controlled by engineering works but only by removing the basal causes: destruction of natural vegetation and misuse of land. It must surely be true, in this connection, that man has often wrought more harm through want of thought than want of heart, and it is doubtful whether the American pioneer has consciously bartered the country's "life blood for the amenities of civilization and opportunities of personal advancement" (p. 18).

Farming economy and practice evolved in north-western Europe have, much to the surprise of the European, proved inapplicable to conditions elsewhere. How inapplicable is still only being learned, though frequently the trouble has been caused by incomplete application—grassland farming and management as understood in England would have saved much of the soil erosion of the United States. It may yet be proved that the most destructive implement ever devised by man is the European steel plough and that, in advocating clean weeding, the European agriculturalist in the tropics is as destructive as the goat. In promoting medical skill and veterinary science and encouraging peace and prosperity amongst native peoples, the European has caused a pressure on the land never before known in Africa and the Orient, and has created problems as yet unsolved. It is rightly urged that the fundamental cause of soil erosion and its attendant evils is faulty land utilization, and the scientific study of land utlization is the first essential in finding the remedy. These and many other matters are all considered in the book under review; one can only regret that the authors have so seen fit to undervalue the intelligence of the average reader as to eliminate practically all references to original research. It is true that they have prepared for the research worker a detailed bibliography elsewhere, but a plea may be put forward for a select list of works in this general book. Despite its price, for which the fine illustrations are probably responsible, a second edition will surely be needed shortly, and such a bibliography would be a valuable addition.

L. D. S.

THE MONTHLY RECORD

THE PLACE-NAME LISTS OF THE P.C.G.N.

Immediately after the War of 1914–18 the Board of Admiralty approached our Society with the request that we should organize a Committee to bring into order the spelling of geographical names for British official use. During that war there had naturally been great confusion in spelling place names or, worse, in the choice of names when there were several for the same place, in use by different nationalities. At a meeting on 29 April 1919, after the Armistice, but before the conclusion of peace, a committee was formed, with representatives from all the principal Departments of State and from our Society, under the chairmanship of Major-General Lord Edward Gleichen. In the twenty years since then the Permanent Committee on Geographical Names for British Official Use (P.C.G.N.), served with great intelligence and devotion by its secretary, the late Mr. J. H. Reynolds, has published many Lists of Place Names, which give the official form used in the country, sometimes preceded by the conventional name used in English, where necessary an indication of the pronunciation and stress, and the alternatives in different languages. After the death of Mr. Reynolds in 1937 Mr. M. Aurousseau became Secretary of the Committee and took in hand a compilation of the individual lists into a World List; but the invasions, conquests, and seizures of the last few years, with the growing fashion for changes in national orthography, much impeded its preparation, nor is it at the present time possible to complete it. But the individual lists are all available; some titles are set out on p. viii of the Advertisement pages in this number; and as an example of their value we may cite the First List of Names in Poland (West) and Danzig, published October 1928, and the Second List of Names in Poland (East) in November 1930.

The capital Warszawa is called by the English Warsaw, the French Varsovie, the Germans Warschau: all these and other variants are given. The introduction on the pronunciation of Polish tells us that the *w*'s are *v*'s; and the *sz*=*sh*: so the pronunciation is Varsháva, with the stress on the second syllable indicated by the acute accent. More difficult is **Łódź**, commonly printed Lodz by those whose diacritical marks are few. The hard *ł* is nearly a *w*, the *ó* nearly a *u*, the *ź* nearly *zh* in this final position, but not always, so that **Łódź**=Wudzh. The river we conventionally call the Vistula is spelled Wisła and pronounced Viswa. Bydgoszcz (*pron.* Bídgoshch) is too often given its German name Bromberg in the newspapers, and the fortress of Toruń called Thorn. The place we call conventionally Teschen was properly Těšín when it was Czech, and since a little while ago it became Polish is Cieszyn (*pron.* Tsyéshin): that *c* is pronounced *ts* may be remembered from Łuck, pronounced Wutsk. It is not easy to be always correct in these pronunciations, but there is every reason why in present circumstances we should try; as for printing, the case of newspapers is hard, for their Linotypes have not the multitude of diacritical marks and cannot easily add them to their keyboards. But Monotype users can obtain the necessary matrices in some founts at any rate, as our printers have for printing this *Journal*, and one may reasonably hope that the twenty years' work of the P.C.G.N. will bear fruit in the accuracy of place names in official publications.

HIMALAYAN JOURNAL, VOL. XI

The *Himalayan Journal*, vol. XI, contains as usual a number of well-illustrated papers on recent expeditions, and in addition discussions on subjects of general interest to climbers and students of mountain physiography. Last year's

attempt on Masherbrum is described by J. O. M. Roberts, and the 1938 German expedition to Nanga Parbat by Paul Bauer. In discussing the failure Bauer concludes that they should have been prepared to fight their way from base to summit through deep snow in bad weather, but that lack of preparation for this and the recollection of previous disasters prevented the attack being undertaken in this spirit. The American Alpine Club expedition to K^2, though planned as a reconnaissance, succeeded, as Mr. Charles Houston relates, in ascending to over 26,000 feet. Professor R. Schwarzgruber describes the ascents of another German expedition in the Gangotri district, where two summits of over 22,000 feet were climbed. This area was triangulated by a party of the Survey of India in 1936, and Captain G. Osmaston relates his experiences in this type of mountain survey. The surveys of the central Himalaya were continued in northern Almora in 1938. Mr. Kingdon Ward describes his reconnaissance of the highest peak in Burma, at the sources of the Nam Tamai, a large tributary of the eastern Irrawaddy. This is shown as Hkakabo Razi (19,296 feet) on the Survey of India sheet, but he suggests the correct name is Ka Karpo Razi, the Tibetan for white snow mountain.

Among the general papers, Dr. G. A. J. Teasdale discusses the diet problem for Himalayan mountaineers, arguing that in the past diets prepared for Polar expeditions have been followed too closely. The Editor, Professor Kenneth Mason, contributes a note on the problem of Mount Everest; he argues that it has yet to be shown that a small party will necessarily be more successful than a large, and again emphasizes the vital importance of health and diet.

TRAILS AND ROADS IN LIBERIA

Dr. G. W. Harley, of the Methodist Mission at Ganta, describes the evolution and present condition of the trails and roads of Liberia in the *Geographical Review* for July 1939. The main routes are the thousands of miles of native trails, for except on the coast there is little travel by water. The main trails have been improved for hammock travel, and are therefore in theory fit for motor cycles, but there are still difficult patches, and the lack of bridges is a further handicap. In the interior there are fifteen tribes who are essentially hill people, with no knowledge of the sea and reluctant to use rivers, partly because of the activities of the secret societies of "water people." In the forest therefore the trails cross the rivers at right-angles, and keep close to the watersheds. In a belt about 100–150 miles inland, where the headwater streams join the larger rivers, these main trails are connected by a network of cross trails, on which it is easier to move than along the coast. Here the trails are constantly turning and twisting, but preserve in general the shortest practicable route from town to town. The main trails, along which the trade of the country moves, appear to have changed little for centuries. The development of the trails has therefore been partly controlled by the river systems and the beliefs of the tribes.

With the recent increase in trade, some of these trails are being made into roads. Dr. Harley describes in detail a journey from Monrovia to Sanoquelle along the old native trail. The first portion, running inland about 50 miles beyond Memeta, is fit for motors. This district is rich in laterite pebbles or concretions, which make good road metal. Between Memeta and Reputa the trail passes through swamps, and beyond Reputa it ascends a 400-foot rocky escarpment, a serious obstacle to road building. The road has been surveyed as far as Sanoquelle, and large sections, interrupted by rivers, have been built. Sanoquelle is the headquarters of a district with an estimated population of at least 300,000.

Dr. Harley's paper is accompanied by a map, largely based upon unpublished

material, of the old trade routes, showing their relation to the physiographic regions, and a more detailed map of the roads and trails of central Liberia compiled by the author from compass traverses. He also gives interesting notes on the characteristics of the forest, and on the weather at Ganta, based on a six-year record. The mean rainfall for December and January approaches zero, and there are four or five weeks each year with no rain. The mean annual rainfall over the period was 77 inches, with a maximum of 84·5 inches in 1928, and a minimum of 68 inches in 1929. Temperatures in the shade are never oppressive, and there are few days when work outdoors is impossible.

NORSE RELICS IN ONTARIO

In the *Journal* for April 1938, pp. 395–6, we published a note on a reported find of Norse relics in Ontario, based on information supplied by Mr. P. H. Godsell. The find was stated to have been made at various times by at least four men on the mining claim of Mr. James Dodds at Beardmore, a village 125 miles north-west of Port Arthur. Mr. Godsell has now drawn our attention to a short article by Dr. C. T. Currelly, director of the Royal Ontario Museum of Archaeology, in the *Canadian Historical Review* for March 1939. The account of the find given by Dr. Currelly, and of the way in which the relics came into the possession of his Museum, differs somewhat from that originally published. The whole find, consisting of a sword broken into two pieces, an axe, and a shield grip, was discovered by Mr. Dodds on 24 May 1930, after he had blasted away a clump of birch trees from the exposed face of a quartz vein. After some delay, Dr. Currelly was informed of these relics, and, having satisfied himself about the circumstances of their discovery, bought them for his Museum. He was particularly impressed by the fact that they formed a set.

Photographs were sent to a number of well-known Norse archaeologists, who agreed that "the sword and axe could well be of the same period, and that from 900 to 1000 would be a general statement of date." Dr. Currelly comments that "we are met with the seemingly incredible fact that a Viking was buried near Lake Nipigon." The Indian practice of sharing out articles of value makes it unlikely that the set was traded from James Bay or the Labrador coast. He suggests that the Vikings may have reached Lake Superior *via* James Bay and Lake Nipigon. Mr. Godsell points out that an Indian trail runs from the neighbourhood of Fort Albany on James Bay, up the Albany and Kinogami rivers, and across to Lake Nipigon by the Blackwater river, the latter portion of the route passing near the site of the find, and suggests that this may have been the Viking route.

WEATHER OF THE COLORADO ROCKIES

An extensive paper by Ronald L. Ives, "Weather phenomena of the Colorado Rockies" (*J. Franklin Inst.*, December 1938), is a valuable contribution to the study of complex and erratic mountain weather. The Colorado Rockies, a series of roughly parallel ranges trending W.N.W.–E.S.E., rising to a maximum elevation of 14,500 feet above sea-level, have a general elevation of 8000 feet above the plains and 5000 feet above a number of intermontane plateaux or "parks." Volcanic activity in Eocene and Miocene times fashioned the topography to some extent, the lavas, ashes, and breccias smoothing over the intermontane basins; but repeated glaciation during the Pleistocene gave the topography its present rugged form.

The annual precipitation is much influenced by topography, varying locally from less than 8 to more than 60 inches. In summer the extreme temperature rarely exceeds 110° F., and in winter rarely passes below −40° F. Frequent cyclones during the winter months bring snowfalls which constitute the only

important source of moisture to the region. Chinook winds occasionally melt a good deal of snow in leeward valleys, but on the other hand it is just in valleys so situated that drifting snow, which often travels great distances, tends to accumulate. In fact most of the existing glaciers in the Front Range area, which lies northward of Pike's Peak and west of Denver, are essentially maintained by drifting snow, the *névé* fields being now too small to nourish their dependent glaciers from normal snowfall. The summer weather conditions are of particular interest and complexity. The only moisture that enters the region from outside comes from occasional cyclones, which are much less frequent than in winter and pass farther north; but there are two types of severe local convectional storm which, supplied by local moisture, form more or less self-contained systems. One type known as "regional storms" develops over the intermontane basins, influencing areas of the order of 10,000 square miles; the other type, known as "valley storms," originate in the valleys at a lower level than the regional storms, influencing areas of 200 square miles. The regional storms tend to develop every summer day in one or more of the four great intermontane basins; they are intensified by cyclones but inhibited by anticyclones. The valley storms occur daily in perhaps 200 of the 500 or more valleys in the Colorado Rockies which could contain simultaneous local storms. These are not, like the regional storms, prevented from forming by anticyclones, but like them are intensified or modified by cyclones. Except sometimes at the heads of the cirques, cumulus clouds associated with the valley storms are quite distinct from those of the regional storms, but when a cyclone crosses the mountains, giving rise to a summer blizzard accompanied by thunder and lightning, it is impossible to distinguish the cloud formations due to the three systems. Both the regional and valley storms tend to increase the flow of the Platte and Arkansas rivers at the expense of the Colorado.

The bearing of Rocky Mountain weather on soil erosion, irrigation, and aviation is briefly discussed. A number of interesting local weather phenomena are described with a discussion of their significance in weather prediction. In summer great cloud plumes, sometimes miles in length, stream eastwards from the high peaks, especially Longs Peak and Mount Evans. A photograph of a plume on Longs Peak is striking. This is attributed to warm moist currents from the flanks of the mountains rising into cold and violent summit winds. In general flat-lying plumes are held to indicate high winds in the mountains, dense plumes very cold weather on the summits, nearly vertical plumes mild weather there, and the absence of these banners warm weather.

GRASSLANDS OF THE SOUTH ISLAND, NEW ZEALAND

The history and present condition of the tussock-grasslands of the South Island of New Zealand are discussed by Mr. V. D. Zotov in the *N.Z. Journal of Science*, Sect. A, for December 1938. These grasslands, which he classifies as steppe, now occupy most of the South Island east of the main divide, with the exception of the coastal hills and the land below 300 metres, mainly under cultivation. Over the greater part of this area the soil is derived from greywacke or from mica-quartz schist. The climate is characterized by relatively cool summers and warm winters. From historical sources and the evidence of existing vegetation, the author has been able to determine approximately the distribution of the original vegetation: steppe up to 600 metres, with forest above, up to the timber line at 1200 metres. Present areas of steppe above 600 metres must therefore have been introduced by human action.

The effect of settlement has been in general to alter the natural succession of grass, scrub, forest, to forest, second growth, grass, semi-desert. The main

cause of this change has been the destruction of the forest and the annual firing of the grassland by the pastoralists. Their first aim was to destroy unpalatable species, but the practice was greatly extended when it was found that the young growth of these species was relatively palatable. This periodic procedure is strongly condemned by the author. The tussocks raise the humidity at ground level by providing shelter from the sun and wind, and act as a refuge for palatable species. When the tussocks disappear, the associated species die out also, and the land becomes semi-desert. A further cause of depletion is overstocking with sheep. It was formerly believed that rabbits were the main cause of depletion, but the author holds that the great increase of rabbits has accompanied, rather than caused, the destruction of the vegetation cover. On the hill slopes depletion is followed by soil creep, gullying, and sheet erosion. The remedy for this condition is a great restriction of firing and the introduction of rotational grazing. For the semi-desert areas, it will be necessary to re-establish unpalatable species of tussocks, and then to plant carefully chosen grasses to re-form the vegetation cover.

RUSSIAN AGRICULTURAL HANDBOOK

A valuable Russian manual, copiously supplied with maps, tables, and diagrams, published by the Institute of Plant Industry at Leningrad in 1937, under the title 'The world's agro-climatic handbook,' describes for the various regions of the globe the climatic requirements of individual crops. The brief English summary gives an account of the method of utilizing the climatic data by G. T. Selianinov and another by the same author of the actual zones into which the globe is divided on this basis, together with a statement on the composition of the handbook by I. A. Holzberg. The world is divided into the following agro-climatic zones characterized by a definite set of crops and agricultural methods as an effect of climatic peculiarities: tropical, subtropical, moderate, polar, and arctic, subdivided again according to temperature and precipitation, with reference also to danger from frost and the need of irrigation. It is claimed that the maps and tables enable the suitability of any territory for a given crop to be determined when the climatic needs of the latter are known.

Emphasis is nevertheless rightly laid on the extreme complexity of the whole subject of agriculture in relation to climate. Similar climates may not be suitable for the same crops, and for this reason Köppen's climatic provinces do not satisfy the needs of agriculture. It is shown that in the subtropical and moderate zones the growing season of most plants is defined by the period when the mean temperature exceeds 10° C. (50° F.). Cold-enduring plants can grow at a temperature of 5° C., whilst warmth-loving plants require not less than 15° C.

OBITUARY

THE RIGHT HON. ESME WILLIAM, FIRST BARON HOWARD OF PENRITH, G.C.B., G.C.M.G.

By the death of Lord Howard of Penrith on 1 August 1939 the Society has lost a Fellow, elected in 1892, who after a long and varied career of high distinction in the Diplomatic Service had been Foreign Secretary of the Society from 1932 until its last Annual General Meeting, having in the spring of this year declined further nomination to that office for reasons of health.

Esme William Howard was born in 1863, the fourth son of Henry Howard of Greystoke Castle, Cumberland. He entered the Diplomatic Service in 1885, and after six months on the staff of the Lord Lieutenant of Ireland in that

critical year was sent to the Embassy in Rome and transferred in 1888 to Berlin, where he saw the first two years of the reign of Wilhelm II and the fall of Bismarck. In 1892 he retired from the Diplomatic Service; travelled in the American continent; was Assistant Private Secretary to the Foreign Secretary in the Rosebery Government of 1894–95; married in 1898 the Lady Isabella Giustiniani-Bandini, daughter of Prince Bandini, eighth Earl of Newburgh; and in the Boer War saw service with the Yeomanry, was made prisoner, and escaped. In 1903 he was reappointed to the Diplomatic Service and was soon made Consul-General for Crete, then nominally under the suzerainty of the Sultan, but actually controlled by the Powers of the "Concert of Europe" through their Consuls-General, with Prince George of Greece as High Commissioner, and the islanders in Venizelist revolt. After two years at the Embassy in Washington, and two as Consul-General in Budapest, he was promoted to be Minister at Berne. In May 1913 he was transferred to Stockholm, where in the first three years of the war of 1914–18 he had the delicate task of supporting our blockade of Germany and at the same time maintaining supplies to Russia through Sweden.

After the Armistice Sir Esme Howard was attached to the British Delegation of the Peace Conference in Paris, and in February 1919 was sent to Poland as British Civil Commissioner on the Inter-Allied Special Commission. In September 1919 he became British Ambassador in Madrid, seeing the establishment of Primo de Rivera as Dictator before he was transferred to Washington in 1924. He was British Ambassador at Washington for six years, and when the time came for him to retire from the public service in 1930 his departure was regretted as much by the people of the United States as by his own countrymen. In his years of leisure he published two important volumes of reflections, 'The theatre of life,' of which the second, with his study of Neutrals and Blockade, and his account of the establishment of the Polish Republic, is of especial interest at the present time.

On retiring from the Embassy to the United States he was created Baron Howard of Penrith. The eldest of his five sons died in 1926; he is succeeded by his second son, the Hon. Francis Howard.

BRIGADIER-GENERAL THE HONOURABLE C. G. BRUCE, C.B.

His many friends in the Society and the Alpine Club were grieved to hear in the summer that General Bruce was seriously ill, and he died on July 12. His leadership of the Mount Everest Expeditions of 1922, and of 1924 until he was invalided, is well known and was the culmination of a life-long activity in exploring the mountainous borders of India and training his Gurkhas and Sherpas in all the Alpine arts. Many of those who knew best the various history of his achievements are not at the moment accessible, and it is impossible to prepare immediately a memoir worthy of him. We shall hope to do so in due course.